2 1 0001

Site: ____
Break: 2.1 ____
Other: ____

4313

Dames & Moore

2 1 0002

JAN 1 4 '82 KCB

415-842-5885
~~Frank~~ BERRYMAN - mgr.
Environmental and Health Protection

Bob Edwards - spoke with on 2/01/90 @ 1400 hrs

President John Pepper Corn

Chevron

Chevron Chemical Company
595 ~~Market Street~~, San Francisco, California
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K. C. Bishop, III
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SAN Ramon, Calif.
94583

CONFIDENTIAL REPORT
SURVEY AND ASSESSMENT OF
FORMER AGRICULTURAL CHEMICAL
PLANT SITE, ORLANDO, FLORIDA
For CHEVRON CHEMICAL COMPANY

JANUARY 10, 1983
3818-068-09

Dames & Moore

Dames & Moore

455 East Paces Ferry Road, Suite 200
Atlanta, Georgia 30363
(404) 262-2915
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[redacted]

Chevron Chemical Company
549 Market Street
San Francisco, California 94105

Attention: Mr. K. C. Bishop

Re: Confidential Report
Survey and Assessment of
Former Agricultural Chemical
Plant Site, Orlando, Florida
for Chevron Chemical Company

Gentlemen:

We are pleased to transmit herewith ten copies of our final report entitled "Confidential Report, Survey and Assessment of Former Agricultural Chemical Plant Site, Orlando, Florida, for Chevron Chemical Company."

An initial [redacted] was submitted for review in [redacted]. The results of that review are included in this report. Subsequently, additional field work was performed at the site. Detailed descriptions of the additional work performed, and the findings are also presented in this report.

It has been our pleasure to provide the services performed on this project for you. Should any questions arise subsequent to your review of the report, or should you desire any additional information, please contact Dames & Moore at your convenience.

Yours very truly,

DAMES & MOORE

William G. Smith
Project Manager

R. E. H.

Robert E. Hunter
Project Geologist

WGS/pdg
Attachment

SUMMARY

As approved by the Chevron Chemical Company under the conditions set forth in Authorization 5, Contract MFG-02, Account 16-70-50-ORL, dated May 20, 1981, and received by letter of February 4, 1982, Dames & Moore has investigated a site in Orlando, Florida, which was previously owned and operated by the Chevron Chemical Company as a chemical blending facility for pesticides, crop sprays, etc. The site is presently owned by the Central Florida Mack Truck Company and is utilized as a truck sales and service facility. As a result of concern for the possibility of chemical waste residue from the previous chemical facility affecting the local ground water quality, the Chevron Chemical Company authorized Dames & Moore to investigate the site surface and subsurface conditions in the general vicinity of the site to determine which chemical residues might remain, if any, and the existing or potential effects on the ground water quality. The investigation included review of the available geologic and hydrologic information, the [redacted] laboratory analysis of ground water and soil samples, evaluation of the acquired data, and the formulation of conclusions and recommendations. Due to the potential sensitivity of the investigation, all work performed was conducted in a confidential manner.

Information acquired during the investigation indicates that the site is underlain by fine to very fine quartz sands to a depth of approximately 33 feet. This sand horizon is saturated with water, usually within a depth of 10 feet, forming an unconfined ground water aquifer. The data acquired indicate that the surface of the aquifer slopes gently to the northeast toward nearby Lake Fairview. The northeasterly slope of the ground water surface indicates a general northeasterly flow direction for the site ground water. The bottom of this near surface aquifer in the site vicinity consists of a clayey zone of undetermined thickness encountered at approximately 33 feet. The existence of the underlying clayey zone limits the potential for

downward migration of ground water in the site area. Lateral permeability tests conducted during the site investigation indicate that the water bearing fine sands are of low permeability (1×10^{-3} to 1×10^{-4} cm/sec). Ground water migration across the site is therefore considered to be very slow, and limited vertically by the underlying clayey zone and horizontally (to the northeast) by the low permeabilities and low hydraulic gradient.

Laboratory analyses of ground water and soil samples indicate that some chemical residues remain in local concentrations on the site. Concentrations of arsenic and lindane are sufficient to exceed primary drinking water standards. Chlordane, DDD-o,p', and DDD-p,p' are found in concentrations exceeding EPA recommendations found in Quality Criteria for Water, 1976. The chemical residues found appear to be derived from the former pesticide washing pond sites which were abandoned by the Chevron Company, subsequently excavated by the present owner, and filled.

The investigation conducted provides no indication that pesticides are currently migrating beyond the existing site boundaries. Arsenic has been detected near the northern site boundary in concentrations slightly in excess of primary drinking water standards. Should pesticide migration occur in the future due to changing conditions, the concentrations would diminish with distance transported and the concentration of the source would be decreased since the existing chemical residues are not being replenished.

The site conditions found to exist during this investigation are evaluated within the report, and conclusions and alternative recommendations are presented for consideration.

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1.0 INTRODUCTION

1.1 GENERAL

This confidential report includes a detailed description and the results of our survey and assessment of a former Chevron agricultural chemical plant site in Orlando, Florida. The site formally occupied by the plant is located at 3100 Orange Blossom Trail, and is presently utilized as a truck sales and service facility by the Central Florida Mack Truck Company. The general location of the site is shown on the Vicinity Map, Plate 1. The chemical plant was utilized as a blending facility for pesticides, crop sprays, etc.

Recently, the Chevron Chemical Company became concerned about the possibility of chemical waste residue from the old plant affecting the local ground water quality. As a result of this concern, the Chevron Chemical Company retained the services of Dames & Moore to survey and assess the existing site for any prevailing chemical residue. A tentative investigation was described in our initial proposal of June 19, 1980. Numerous discussions and communications resulted in a revised proposal which was submitted on February 19, 1981. Following further communications, and a site visit by [redacted] W. Thomas Turner of Dames & Moore, a revised proposal was submitted dated March 31, 1981. Additional communications followed, and resulted in the submission of our final proposal dated May 13, 1981. The scope of work developed in this proposal was performed, and a draft report was submitted. Subsequently, [redacted] were requested, as documented in our proposal, [redacted] This work was performed, and the analyses completed during the [redacted] The sequence of proposals documents the developing ideas for assessment of the site relative to the concern demonstrated for the local ground water quality. The primary variations among the proposals addressed the number and locations of proposed borings and wells, and the pertinent chemical parameters to be tested.

The final scope of work was developed to:

1. Provide an indication of what chemicals may remain in the soil or ground water underlying the property.
2. Provide a general understanding of the ground water regime beneath the property.
3. Evaluate the conditions found to exist on the property relative to the known history of the site.
4. Acquire general information about ground water utilization in the immediate vicinity should offsite contamination become apparent.
5. Develop sufficient information to provide overall conclusions and recommendations about site effects or impacts due to the existence of the former chemical facility.

Under Revision 1 of February 4, 1982 (to contract MFG-02) Chevron Chemical Company requested Dames & Moore to install additional monitoring wells and collect ground water samples for analysis as defined in a proposal dated January 27, 1982; the final scope of work was developed to:

- Install three monitoring wells to be approximately 30 feet deep and screened to intercept the entire water column at the well site.
- Obtain ground water samples for the three new wells and from previous existing wells.
- Submit samples to Orlando Laboratories, Inc. for chemical analysis. Parameters to be tested shall be all of the pesticides previously handled at the plant and arsenic.

- Conduct an additional falling head or constant head permeability test and possibly a specific capacity pump test. This provides additional information on site geohydrological conditions.
- Attempt to obtain additional information on the excavation of the area in the vicinity of the abandoned pesticide washing ponds and what materials were disposed of in this excavation.
- Incorporate results of field studies into our report of previous studies at the site.

In recognition of the sensitive nature of the existing situation, the entire project was conducted as a confidential investigation. The specific nature of the work was not discussed with any outside agency, firm, or person, and neither was the name of Chevron Chemical Company mentioned. The project files and internal memoranda, documents, and data sheets were labelled "confidential." Laboratory samples were identified by job code numbers. Dames & Moore field personnel who conducted the onsite studies, and subcontractors utilized, were thoroughly briefed to the extent required about the confidential nature of the project.

1.2 SITE HISTORY

The Chevron Chemical plant which formerly occupied the site at 3100 Orange Blossom Trail, Orlando, Florida, was utilized as a chemical blending facility processing pesticides, crop sprays, etc. between the years 1950-1976. Two washing ponds were constructed at the site in the prevailing fine quartz sands found near the surface. Residues from chemical barrels were washed into these ponds. The ponds were constructed approximately 20 feet by 60 feet in plan dimension, and were excavated approximately 3 feet into the near surface soils. Active utilization of the washing ponds was terminated in 1976. Subsequently, the site was purchased by the Central Florida Mack Truck Company and utilized as a truck sales and service facility. During preparation of the site by the new owner, an excavation was constructed approximately 14 feet deep within the general area of the ponds. Empty chlordane drums, unuseable equipment remaining from the former chemical plant, and old truck cabs were dumped into this excavation. Surplus concrete was also dumped into and/or upon this area in an attempt to establish a firm surface. The present owner reportedly captures waste oils and antifreeze resulting from the operation of the existing truck facility. The truck facility is presently controlled by Mr. Bill Lean.

2.0 SCOPE OF SERVICES

The investigation consisted of several discrete but interrelated tasks. The investigation initiated with a search and review of the available literature and records pertaining to the geologic and hydrologic regimes of the general site vicinity. The information thus acquired was utilized to plan the location and depth of borings and monitoring wells to be constructed in the site area. A local reconnaissance was conducted to identify ground water users in the immediate vicinity, and to locate nearby streams and water bodies. A ground water utilization computer program was acquired to identify residential and industrial wells within a 3-mile radius of the site. Nine exploratory borings were drilled at the site, and soil samples were acquired at approximate 5-foot intervals. Based upon the information provided by the exploratory borings and the other data acquired, eight monitoring wells were constructed at the site. Selected soil samples from the exploratory borings, and ground water samples acquired from the monitoring wells, were analyzed chemically for parameters which could conceivably remain as residue from the operation of the former chemical plant. The acquired data provided an understanding of the prevailing geologic, hydrologic, and relevant chemical conditions at the site. The information was evaluated relative to possible existing and potential impacts on the site or near vicinity ground water. Based upon the results of the aforegoing, conclusions were derived and recommendations prepared.

The investigation was performed in accordance with the following general chronology of events. Authorization to implement the investigation, as described in our proposal of May 13, 1981 was provided by the Chevron Chemical Company in Authorization 5, Contract MFG-02, Account 16-70-50-ORL, dated May 20, 1981. Telephone communications with Mr. Roger Macauley, the initial project manager, resulted in mutual agreement for a project start date of June 8, 1981. Initial project work consisted of the identification and/or scheduling of qualified subcontractors, specifically drilling, well construction, and chemical laboratory testing subcontractors. At this stage of the project geologic and hydrologic data acquisition was also begun. Chemical parameters to be tested had been established during proposal development, and a chemical testing laboratory capable of providing the required testing methodology at a reasonable price and within a reasonable schedule was located.

The field investigation at the Orlando site was initiated on June 29, 1981. Eight exploratory borings were drilled, soil samples obtained, geologic logs acquired, and water level and surface elevations established by July 2, 1981. During the drilling and sampling of the eight exploratory borings a strong pesticide odor was noticed in some of the borings. Since the odor indicated the possibility of chemical residue in unknown concentrations, the field investigation was temporarily suspended in order that some of the soil samples from the borings that exhibited pesticide odor could be chemically analyzed (see Table II-2 of Appendix II). The analyses were necessary to determine appropriate disposal procedures for drilling spoil and ground water waste which would continue to accumulate during the construction and development of the proposed monitoring wells, and to ensure that the field personnel protection procedures already implemented were adequate. Since work associated with analyzing the soil samples during the field exploration period had not been anticipated, Dames & Moore communicated with the Chevron Chemical Company and acquired authorization to proceed with this out-of-scope task. The analyses of the selected soil samples were performed by Orlando Laboratories, Inc. in Orlando, Florida. Orlando Laboratories had been previously selected to perform the required analysis of the ground water samples at the conclusion of the project. The test results did not indicate contamination of the soil samples to any significant degree, indicating that the odor was derived either from very small trace amounts of pesticide, or from components not related to the former chemical plant. Following the acquisition of the chemical analysis results, additional communications with the

Chevron Chemical Company resulted in an appropriate plan for the handling and disposal of soil and water waste which would result from the forthcoming monitoring well construction, development, and sampling.

The installation of five monitoring wells was begun on July 27, 1981. The five wells were constructed and developed in accordance with Dames & Moore's specifications. The wells were then measured for water levels. Ground water samples were acquired and delivered to Orlando Laboratories, Inc. Ten hand auger probes were also performed. This work was completed by August 6, 1981.

This completed the initial field exploration as described in our proposal dated May 13, 1981. Complete and detailed descriptions of field explorations, procedures, and specifications are provided in Appendix I - Field Explorations and Boring Logs.

Chemical analyses of the acquired ground water samples were conducted during the month of August, and the final results were received in early September 1981. Detailed descriptions of the sampling techniques, sample handling, testing methodology, and chemical testing results are provided in Appendix II - Chemical Analyses Data.

Following receipt of the chemical testing results, all information and testing data acquired during the project to date were thoroughly reviewed and evaluated by Dames & Moore professional personnel to provide a composite understanding of the complex and interacting geologic and hydrologic regimes, with attention appropriately directed toward the chemical residues of concern found at the site. Completion of this work enabled the project personnel to formulate conclusions, and develop the recommendations provided in the draft report dated December 1, 1981.

Field work for installation of the three wells (W-6, W-7, and W-8) authorized in the January 27, 1982 proposal began May 4, 1982 and were completed, as described in Appendix I, by May 7, 1982. Boring B-9 was drilled adjacent to Well W-6 in order to confirm the presence of the clay layer beneath the site.

Samples for chemical analysis were acquired from Wells W-4, W-5, W-6, W-7, and W-8 by methods described in Appendix II. Samples were analyzed during the month of May, and results received early June 1982 (Table II-1A).

An additional constant head permeability test was run in Well W-7, and water table elevations were taken at Wells W-4, W-5, W-6, W-7, and W-8.

Upon completion of this field work and receipt of chemical analyses, the data were analyzed in conjunction with data presented in the draft report to formulate the conclusions and recommendations in this report.

3.0 SITE DESCRIPTION

The site of the former chemical plant is located at 3100 Orange Blossom Trail, Orlando, Florida, and is presently utilized by the Central Florida Mack Truck Company. The general location of the site is shown on the Site Vicinity Map, Plate 1.

The major structures of the existing site and the locations of significant features related to the former chemical plant are shown on the Plot Plan, Plate 2. A large truck facility building is located adjacent to the railroad spur tracks at the south-central property line. A large water tower is located toward the west end of the property. The plot plan shows the location of the two barrel washing ponds previously utilized by the chemical plant. The washing pond area had been excavated and refilled with debris and spoil including empty chlordane drums, left over equipment from the former chemical facility, old truck cabs and debris, etc. Surplus concrete was also dumped upon this area. The former chemical plant loading dock was located adjacent to the railroad spur tracks. The Plot Plan also shows the locations of the nine exploratory borings drilled, the eight monitoring wells constructed, and the ten hand auger probes. The locations of two shallower disposal pits constructed during the field explorations for the disposal of well development water are indicated on the Plot Plan. Where not occupied by the existing facilities as shown on the Plot Plan, the site is covered with numerous truck bodies, frames, engines, parts, etc., and other equipment associated with the maintenance and repair of large truck tractors.

The eastern site boundary lies adjacent to Orange Blossom Trail, the main access to the site. Property to the north of the site is used for a trailer park. A perimeter ditch is located along or near the northern site boundary. Property west of the site is used for some industrial facilities and as a general dump. A shallow swale occurs near the western site boundary. Industrial facilities occupy the property south of the site across the railroad tracks. A service station is located adjacent to the southeast property line across the railroad.

4.0 GEOLOGY

4.1 REGIONAL GEOLOGY

Review of the available geologic literature indicates that Orange County, Florida, is primarily underlain at depth by marine deposits of limestone and dolomite, with interbedded shales, and sands. At great depths (in excess of 6,500 feet), crystalline basement rock exists. The uppermost limestone underlying the site is probably part of the Ocala Group, and would be of late Eocene age. In the general site area limestone probably occurs at a depth of approximately 150 feet.

The buried Eocene limestone in the Orange County area is unconformably overlain by the Hawthorn Formation of Miocene age. In this area the Hawthorn Formation consists of phosphatic clayey sands and sands, usually exhibiting a characteristic light green color. The lower portions of the Hawthorn Formation may contain limestone.

The Hawthorn Formation may be overlain in various locations in Orange County by red clayey sand deposits, marine terrace deposits, or the Caloosahatchee Marl of Upper Miocene to Pleistocene age. The exploratory borings and wells drilled at the site indicate that the general site area is underlain by shallow marine deposits.

4.2 SITE GEOLOGY

Considering the land use history of the site, it is probable that the upper several or few feet of near surface soils consist of disturbed local deposits and probably some fill. The nine exploratory borings, the ten hand-auger probes and the eight monitoring wells drilled at the site encountered generally consistent subsurface materials. Boring logs containing a description of the materials encountered, depths of contact, sampling depths, and Standard Penetration Test blowcounts are presented in Appendix I - Field Explorations and Boring Logs. The data acquired by the field boring program indicate that the site is generally underlain by brown to gray, fine to very fine quartz sand occasionally containing small amounts of silt. The fine quartz sand extends to depths ranging from 28 to 42 feet across the site (minimum and maximum depths), but the majority of the borings indicated a change of material at an approximate depth of 33 feet. The relatively thick fine quartz sand zone is underlain by gray to black clay or silty clay which often appears to occur in layers which alternate with fine quartz sand or silty sand. The clay zone was encountered in every boring, and generally occurred at a depth of approximately 33 feet. The clay zone occurred nearest to the surface at the location of Boring 7 where dark gray silty clay was encountered at an approximate depth of 28 feet. The deepest location of the clay zone surface was found in Boring 9, at a depth of approximately 42 feet. The remaining 6 borings encountered the upper surface of the clay zone within the narrow depth range of 32.5 to 33.5 feet.

The fine sands and clays described are most likely shallow marine deposits of Pleistocene age. Marine terrace deposits of probable Pleistocene age are known to occur in the central Florida area, and the site materials were mostly likely deposited under shallow marine conditions during the formation of the terraces. Many of the shallow marine sediments found in the general Orange County area were deposited during Pleistocene interglacial periods, at which times elevated sea levels occurred. The dark clayey mateials found beneath the fine sands probably represent an ancient shallow lagoonal or swampy environment.

Evaluation of the data acquired during the exploratory boring program indicates, in general, very consistent subsurface conditions across the site. The fine quartz sands encountered in every boring were very similar, varying primarily in color and with an occasional modest silt content. Gradation analyses were run on two of the soil samples, and the results indicating grain size and classification are presented on the Gradation Curves, Plates 5 and 6. The deeper clay zone described appears to entirely underlie the site since clay materials were encountered in every boring. Interpretation of the data pertinent to the elevation of the clay zone surface could indicate a general sloping of the surface to the northwest with irregularities, since Boring 7 at the southeast corner of the site encountered the clay at 28 feet and the remaining borings (except for Borings 2 and 9) located across the northwestern half of the site encountered the clay surface at approximately 33 feet. Boring 2 and Boring 9 appear to have encountered local anomalies consisting of a depression approximately 6 feet deep and 9 feet deep, respectively, in an otherwise locally level clay surface. Considering the probable origin of the clay deposits, that of migrating lagoons and swamps adjacent to dune and beach deposits, irregularities would be expected. Therefore, rather than predicting a smooth slope for the clay zone surface from the southeastern corner of the site to the general 33-foot depth defined by several of the borings at the central site area, it is more likely that the clay surface would be irregular or undulatory beneath these areas of the site. Except for the depression defined by Boring 2, the northwestern one-half of the site appears to exhibit a remarkedly flat-lying clay zone surface at an approximate 33-foot depth.

5.0 HYDROLOGY

5.1 REGIONAL HYDROLOGY

The ground water regime within the general Orange County area consists of a unconfined aquifer, extending from near the ground surface to a depth of approximately 40 feet, and the deeper and more extensive Floridan aquifer. The unconfined aquifer is separated from the Floridan aquifer by a thick confining layer of clays, clayey sands, and silty sands. Within the Central Florida area the confining layer usually consists of the Hawthorn Formation. Occasional minor aquifers may occur in relatively clean sand zones within the confining layer. The majority of the water wells that have been constructed into the unconfined aquifer in the Orange County area are of small diameter, but generally provide water sufficient for domestic purposes. In general, these wells may average 5 to 10 gpm. The ground water surface occurs at shallow depths within the local site vicinity, and is usually located within 5 feet of the ground surface. The water in both the unconfined aquifer and deeper aquifer fluctuates seasonally, generally varying less than 5 feet for the unconfined aquifer and in excess of 5 feet for the Floridan aquifer.

The Floridan aquifer is highly permeable and extensive in area. It is the principle aquifer of the vicinity. The Floridan aquifer is primarily composed of limestone (Eocene age) and is generally between 1,500 and 2,000 feet thick. Most all the industrial wells in the vicinity have been constructed into the Floridan aquifer. The top of the Floridan aquifer is over 150-feet deep in the site vicinity.

The primary source of recharge for the unconfined aquifer is rainfall which permeates the nearsurface sands. The Floridan aquifer in Orange County receives most of its recharge by permeation of surface water and rainfall in the western highlands where the confining beds are locally rather thin and semipermeable.

The water quality of ground water found in the unconfined aquifer can exhibit considerable variation dependent upon several parameters including the composition of the aquifer, nearsurface soil conditions, proximity to surface contamination (farmland fertilizers, irrigation canals, septic tanks), etc. For these reasons, water acquired from the unconfined aquifer is utilized principally for farm stock watering and irrigation.

5.2 LOCAL WELLS

During the collection of information for the project it was found that the United States Geologic Survey (USGS) had acquired data on the industrial and residential wells of the Orlando area, and had stored the pertinent information in their computer. By providing USGS a set of boundaries which surround the general vicinity, it was possible to acquire a listing of the industrial and residential wells contained in the computer files, and pertinent data including the owners of the wells, the date of well completion, the depth of the wells, location by latitude and longitude, the aquifer utilized, and some pump discharge data. The locations of the wells found within a 3-mile radius of the site are shown on the Vicinity Well Location Map, Plate 3. The residential and industrial wells identified are separately keyed. The wells are identified by the computer number assigned, and are therefore not consecutive. Table 5-1 contains specific data pertinent to the individual wells identified including the owner, the date completed, and the well depth. Since it is possible that some wells in the near vicinity of the site may not have been listed in the USGS computer data file, a field survey was conducted. The survey was performed within the immediate site area, and extended further to the north and east which appears to be the general direction of local ground water flow in the unconfined aquifer near the site. The local survey disclosed that most of the property owners in the immediate area utilized city-supplied water. Only one property was identified with an active well, and this property was located approximately 1.3 miles northwest of the site and away from the direction of ground water flow.

5.3 SITE HYDROLOGY

The nine exploratory borings drilled at the site and the eight monitoring wells all encountered ground water existing under water table conditions. Water level data were acquired at various times during the field investigation, and these data are presented in Tables I-2 and I-2A in Appendix I - Field Explorations and Boring Logs. As expected, and as discussed in Section 5.1, Regional Hydrology, the local water table fluctuates in response to seasonal impacts and even local heavy rainfall. The water levels acquired on various days exhibited a degree of fluctuation as anticipated. The ground water surface level at the site will probably vary by as much as a few feet during the extreme of seasonal changes, but the slope of the ground water surface across the site probably remains generally consistent. Ground water level data acquired during July and August 1981 were evaluated, and utilized to construct the Water Table Surface Contour Map, Plate 4. Ground water level data acquired during May 1982 were utilized to prepare the Water Table Surface Contour Map, Plate 4A. During the evaluation, the data were synthesized to depict the average or typical ground water surface contours representative of the water table surface found during the site investigation. Since precise elevation information in the site vicinity was not available, an arbitrary elevation datum of 100 feet was assumed and the contour elevations shown on the Water Table Surface Contour Map are therefore estimates relative to the arbitrary datum utilized. It is believed that the arbitrary datum of 100 feet is reasonably close to the true mean sea level datum in the site area, and the contour relationships and flow directions indicated would be the same regardless of whether an arbitrary datum or another datum were utilized.

During July and August 1981, ground water was generally encountered at a depth of 6 to 7 feet in the western half and southern portions of the site. The ground water was deepest at the northeast corner of the site, generally being encountered at a depth between 9 to 10 feet, with a maximum depth of 12 feet 1 inch being recorded. During the May 1981 field work, ground water in Wells W-4 through W-8 varied between 5 and 7 feet. Review of the contours displayed on the Water Table Surface Contour Map indicates the general ground water flow direction in the site vicinity to be northeasterly.

Constant head permeability tests conducted during the field investigation indicate that the fine quartz sands forming the unconfined aquifer beneath the site are of low permeability, falling within the range of 1×10^{-3} to 1×10^{-4} centimeters per second. The low permeability value is probably indicative of the fine to very fine sand found at the site, supported by the modest silt content often encountered. The measured permeability values are probably representative of horizontal permeabilities across the site.

At least within the immediate vicinity of the site, the ground water in the unconfined aquifer appears to be restricted from vertical migration by the clayey materials encountered by every exploratory boring at an average depth of about 33 feet. Lateral northeasterly migration would be slow due to the low permeability and low hydraulic gradient exhibited by the local aquifer.

TABLE 5-1

VICINITY WELL DATA

Well No.	Owner	Date Completed	Depth (ft)
Industrial Wells			
2	Orlando Utility	03/31/58	1,500
3	Orlando Utility	12/06/57	1,415
4	So. States Util.	09/03/57	525
5	So. States Util.	11/30/56	345
6	Orlando Utility	06/01/57	1,220
7	Orlando Utility	09/01/71	--
8	Orlando Utility	05/01/58	1,349
9	Orlando Utility	09/05/58	1,159
10	Orlando Utility	05/29/58	1,406
12	Orlando Utility	01/30/59	1,445
14	Orlando Utility	01/01/67	1,404
24	Gen. WTRWKS	01/01/54	1,275
27	So. States Util.	09/22/58	302
31	So. States Util.	08/11/70	363
32	So. States Util.	01/01/59	350
Residential Wells			
1	Mrs. Earl P. Arker	05/01/42	120
2	Dr. Jos Safian	01/01/41	240
5	M. Carrington	01/01/40	250
6	Fred Ewen	06/01/41	310
7	Bandys Dairy	--	140
8	Dubsdread Club	01/01/35	280
9	E. A. Gunter	07/21/48	345
10	Orange Co. School	01/01/46	380

6.0 CHEMICAL ANALYSES

6.1 RATIONALE FOR PARAMETERS CHOSEN

Parameters for which the ground water samples were to be analyzed were agreed upon by Chevron and Dames & Moore, and were based on chemicals handled at the site during its active life. The parameters are listed in Appendix II - Chemical Analyses Data, Tables II-1 and II-1A. Ten ground water samples were analyzed.

Three soil samples were also analyzed. The parameters utilized during the laboratory analysis of the soil samples are listed in Appendix II, Table II-2.

The results of ground water analysis are discussed in terms of its quality as drinking water or effects it could have on aquatic life if exposure ever occurred.

6.2 GENERAL RESULTS

Appendix II contains the pertinent tabulated data acquired from the laboratory reports on the chemical analyses performed on the ten ground water samples and the three soil samples. Most of the samples were well within accepted safety limits for all parameters measured. Several of the ground water parameters exceeded at some of the sample locations do not constitute a safety problem for human consumption, but rather tend to make the water less aesthetically pleasing. These include: total dissolved solids (500 mg/liter - Secondary Drinking Water Standard), sulfate (250 mg/liter - Secondary Drinking Water Standard), and manganese (0.05 mg/liter - Secondary Drinking Water Standard). Other exceedences of drinking water or recommended standards were more serious and are discussed in detail in Section 6.3. Table 6-1 summarizes the ground water sample exceedances with respect to the relevant standards or recommended limits. Most of the exceedences we found in water sampled from monitoring Well 3.

6.3 DISCUSSION OF ANALYSES - GROUND WATER SAMPLES

Of the 28 chemical parameters measured, only 5 were found in concentrations in excess of what is considered safe for human consumption or in excess of protection limits for freshwater aquatic life. These parameters are: arsenic, lindane, chlordane, DDD-o,p', and DDD-p,p'. The following sections discuss the safety limits of these materials and how they relate to the concentrations found in the wells. The safety limits for freshwater wildlife are taken from the latest EPA Quality Criteria for Water. Human health considerations are based on the background information used to develop RCRA guidelines or drinking water standards where they exist.

6.3.1 Arsenic

While arsenic compounds are ubiquitous in nature, most are insoluble in water. The concentrations of arsenic found at sample locations W-3, W-4, and W-8 are in all probability a result of pesticide handling activities that took place on this site.

The concentration of arsenic in the sample taken at locations W-4 and W-8 is only slightly higher (80 μg/liter) than the standard for domestic water supplies. Since this water is not expectd to be used as a domestic water supply, no serious problems exist. The concentrations are also below the levels considered toxic to plant life.

The concentration of arsenic in the sample taken at location W-3 (680 μg/liter) is more than ten times the drinking water standard and could constitute a hazard if consumed over any length of time.

6.3.2 Lindane

Lindane was the second of the five compounds found to occur in excessive concentrations in the water at location W-3. EPA has recommended a criterion of 4 μg/liter for domestic water supply.

The EPA recommended criteria for the protection of aquatic life is 0.21 μg/liter for a 24-hour period.

The concentration of 26 μg/liter found at location W-3 is well in excess of both human consumption and aquatic life protection standards.

6.3.3 Chlordane

Chlordane is the third pesticide found in excess at sample location W-3 where a concentration of 644 μg/liter was found. A limit of 3 μg/liter for chlordane in drinking water is suggested under the EPA recommended criteria.

The EPA recommends a limit of 0.024 μg/liter over a 24 hour period as a maximum to protect aquatic life.

6.3.4 DDD

The two common isomers of this compound (p,p' and o,p') were both found to be in excess at the sample location W-3. DDD-p,p' was found in sample W-1 in concentrations slightly exceeding appropriate standards. The recommended standard for DDD in drinking water is 0.36 μg/liter.

A 24-hour average of 0.001 μg/liter is recommended in order to protect aquatic life.

Concentrations of DDD-o,p' and DDD-p,p' at W-3 (224 μg/liter and 878 μg/liter, respectively) render the water unfit for either human consumption or for use by freshwater aquatic life.

6.4 DISCUSSION OF ANALYSES - SOIL SAMPLES

During the drilling of the borings and acquisition of the samples, pesticide odors varying from very weak to strong were noticed. Occasional odors of oil were detected in some nearsurface deposits. The type, depth, and relative strength of the odors detected are indicated on the boring logs. In general, the pesticide odors were most noticeable in the four borings which were located around the abandoned pesticide washing pond sites, with the strongest odors coming from Boring 1 and 4 to the north and east of the abandoned pond sites. The remaining borings around the periphery of the site exhibited some slight odors except for Boring 8 where no odors were detected. Slight odors were also detected in the hand auger probe samples. It is possible that the odors offensive in the hand auger probes would diminish with depth similar to the pattern found in Boring B-7, and that they occur as a result of local spills during former loading activities along the spur line.

Soil samples were analyzed due to the occurrence of odors recorded by the field engineer. Three samples exhibiting odors were selected, and subjected to laboratory analysis for the parameters listed on Table II-2 in Appendix II. The results of the laboratory report are also presented on Table II-2.

Review of Table II-2 indicates only three unusual concentrations. Sample B-1-5 contained a 1 μg/l concentration of chlordane. This concentration is under the 3 μg/l EPA recommended criteria and does not constitute a problem except to indicate the presence of pesticide chemicals.

Sample B-3-5 exhibited a 2 μg/l concentration of lindane, well under the EPA recommended criteria of 4 μg/l. This concentration also does not constitute a problem, except for the indication of presence.

Review of the available information indicates that the odors detected in many of the exploratory borings are not due to the presence of pesticide. The consistency of the odoriferous soils across the site indicates the presence of a rather widespread (local?) foreign material which may be related to previous or existing site activities, or may have been introduced from offsite by surface water transportation (flooding and runoff), or permeation through the ground water.

TABLE 6-1

SUMMARY OF SIGNIFICANT WATER QUALITY HUMAN HEALTH STANDARD AND GUIDELINE EXCEEDANCES
(Ground Water Samples)

Parameter	Standard	Source	Sample	Measured Concentration
Chlordane	3 μg/l	EPA rec limit	W-3	644 μg/l*
Lindane	4 μg/l	Primary drinking water standard	W-3	26 μg/l*
DDD-o,p'	0.36 μg/l	EPA rec limit	W-3	224 μg/l*
DDD-p,p'	0.36 μg/l	EPA rec limit	W-3	878 μg/l*
DDD-p,p'	0.36 μg/l	EPA rec limit	W-1	6 μg/l*
Arsenic	50 μg/l	Primary drinking water standard	W-3	680 μg/l*
Arsenic	50 μg/l	Primary drinking water standard	W-4	80 μg/l*
Arsenic	50 μg/l	Primary drinking water standard	W-4	60 μg/l**
Arsenic	50 μg/l	Primary drinking water standard	W-8	90 μg/l**

*From chemical analysis August 1981.

**From chemical analysis May 1982.

7.0 EVALUATION

Consideration of the local site hydrology and geology, and the results of the chemical analyses previously described enable the development of pertinent evaluations and conclusions. The specific site hydrologic parameters including low permeability, an indicated ground water slope and flow direction to the northeast, and the confinement of the local ground water to the unconfined aquifer above the clay zone generally found at approximately 33 feet, strongly indicates that any migration of pesticide materials would be somewhat restricted to the site vicinity and probably located at or northeast of the abandoned pesticide washing pond sites (the apparent major source of site chemical residue). Review of the chemical analyses shows that the major pesticide and arsenic concentrations encountered were found in Monitoring Well 3, located nearby and to the northeast of the washing pond sites. Monitoring Well 5, located to the northeast of the washing pond sites, but at a considerably farther distance than Monitoring Well 3, exhibited no pesticide or arsenic whatsoever. Monitoring Well 2, located upgradient from the indicated direction of ground water flow, also encountered no pesticide residue. Monitoring Well 1, located upgradient encountered trace amounts of chlordane, but not in sufficient quantities to exceed applicable standards. DDD-p,p' was found to slightly exceed standards in Monitoring Well 1. It is probable that the residues found in Monitoring Well 1 are due to a local spill of a small amount of pesticide during the operation of the previous facility. An alternative explanation to the pesticide found in Well 1 could be contamination induced by upgradient disposal (in onsite pits, Plate 2) of ground water produced by drilling and developing the monitoring wells. Monitoring Wells 4 and 8, located north of the washing pond sites and adjacent to the northern site property line, encountered arsenic in concentrations slightly exceeding applicable standards. Monitoring Well 6 encountered arsenic concentrations slightly less than the standards. The arsenic in these monitoring wells could be due to local transportation by the site ground water from the northwestern extremity of the washing pond sites, or from a local spill during the operation of the previous facility. It is also possible that the residues found in Monitoring Wells 1, 4, 6, and 8 have been transported onto the site from offsite contaminated areas; specifically, nearby local applications of fertilizer or pesticide could have migrated over the site with surface water runoff, or could have penetrated into the immediate ground water regime and thereby have been transported onto the site.

Based upon the field investigations described, the chemical analyses conducted, and the evaluations performed, it is concluded that residues from pesticides associated with the former agricultural chemical plant remain at the existing site, and in some locations exceed governmental standards for drinking water or recommended water quality criteria (see Table 6-1).

Pesticide residues remaining at the site in concentrations of significance appear to be derived from the former pesticide washing pond sites which have been abandoned, excavated, and filled. Minor migration by ground or surface water transportation to the northeast may have occurred, or later excavations into the washing ponds may have further distributed the residues, but there are no indications that any pesticide is currently being carried beyond the existing site boundaries.

Small or trace pesticide residues appear to occur at a few locations remote from the abandoned washing pond sites. These are most likely derived from local surface spill of pesticides during operation of the previous facility. Therefore, the investigation indicates that the pesticide washing pond sites and immediate area are the primary source for any remaining chemical residues.

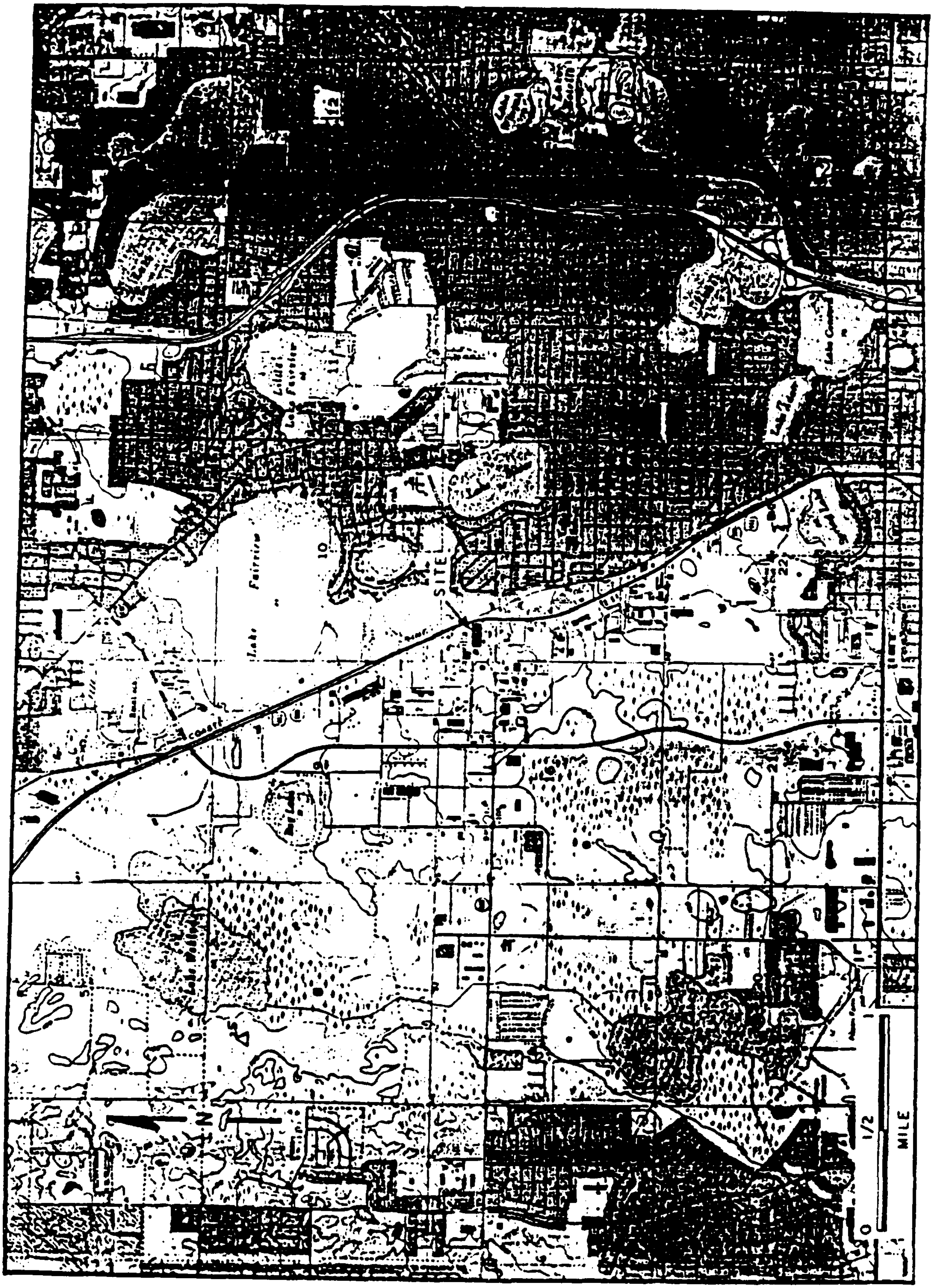
The geologic conditions found to exist in the site area should confine any residue migration to the unconfined aquifer, i.e., the upper approximate 33 feet of fine quartz sand deposits immediately underlying the site. The underlying clay zones should prohibit migration to deeper aquifers. The northeasterly slope of the water table surface underlying the site indicates a prevailing northeasterly flow of the site ground water. The occurrence of pesticide in Monitoring Well 3, northeast of the abandoned pesticide washing pond sites, is possibly indicative of migration due to the northeasterly ground water flow. Previous excavation procedures could also account for the pesticides detected in Monitoring Well 3. The lack of pesticide in Monitoring Wells W-4, W-5, W-6, W-7, and W-8, north and east of the washing pond sites but at a greater distance and near the northern site boundary, provides evidence substantiating that the migration of pesticide may have been limited to the local washing pond vicinity and that pesticide is not currently migrating beyond the existing site boundaries. The concentration of arsenic in Wells W-4 and W-8 (both adjacent to the northern boundary of the site) indicate that arsenic may currently be crossing the site boundary at concentrations above primary drinking water standards.

A change in the prevailing ground water conditions could result in an increased piezometric surface gradient and consequential increased rate of flow for the ground water underlying the site. Conceivably, such conditions could result in increased migration of pesticide and arsenic found in the vicinity of the former washing pond sites; however, due to the low permeabilities exhibited by the subsurface soils at the site, any such migration should be slow and should exhibit diffusion with distance. Furthermore, any migration occurring would further decrease concentrations since the source is not being replenished. Accordingly, it is believed that should any pesticide be transported beyond the site boundaries due to a significant change in the hydrologic conditions, the concentrations associated with such pesticide would be very low.

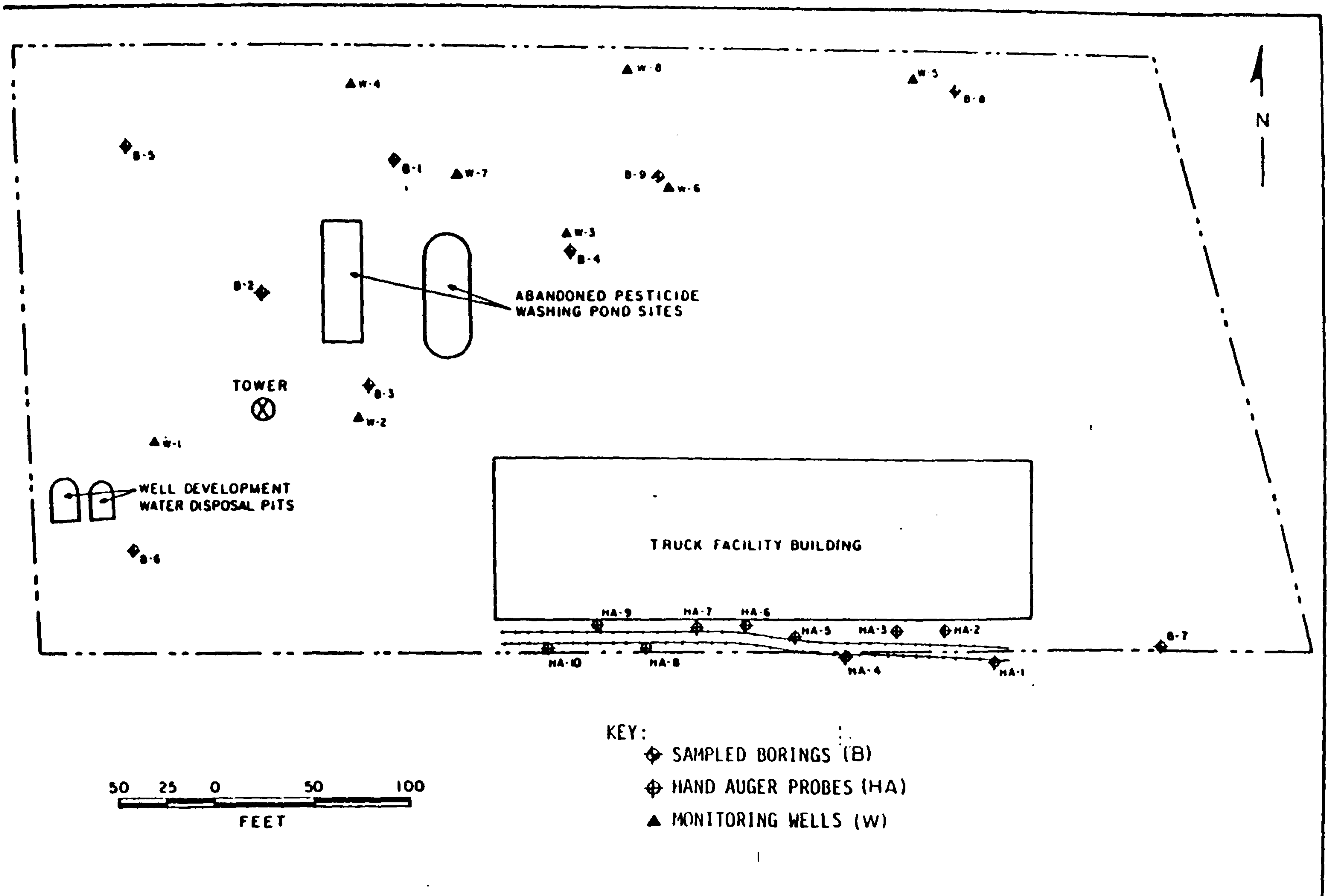
8.0 CONCLUSION

Assuming that the hydrologic conditions encountered during the investigation discussed herein remain consistent, it is most probable that the locations and distribution of the chemical residues found at the site will remain essentially as described. Under these conditions significant migration of the chemical residues would not be expected to occur, and the impact upon the site ground water would not be expected to differ substantially from that already detected. Significant impacts to offsite ground water quality would not be expected. Should the site hydrologic conditions change in the future (i.e., a steepening of the site piezometric surface slope and commensurate rate of flow) due to a lowering of the vicinity ground water table, additional migration by ground water transportation could occur. Such a situation could result in increased dispersion of the chemical residues across the site and possibly beyond the site boundaries. However, any increase in dispersion would probably be accompanied by a significant decrease in concentration and, over a period of time, would result in an overall reduction in concentrations since the source for the residues is not being replenished..

Should the Chevron Chemical Company elect, in the future, to pursue additional investigation of this site, Dames & Moore would be most pleased to assist with consultation and/or field explorations.

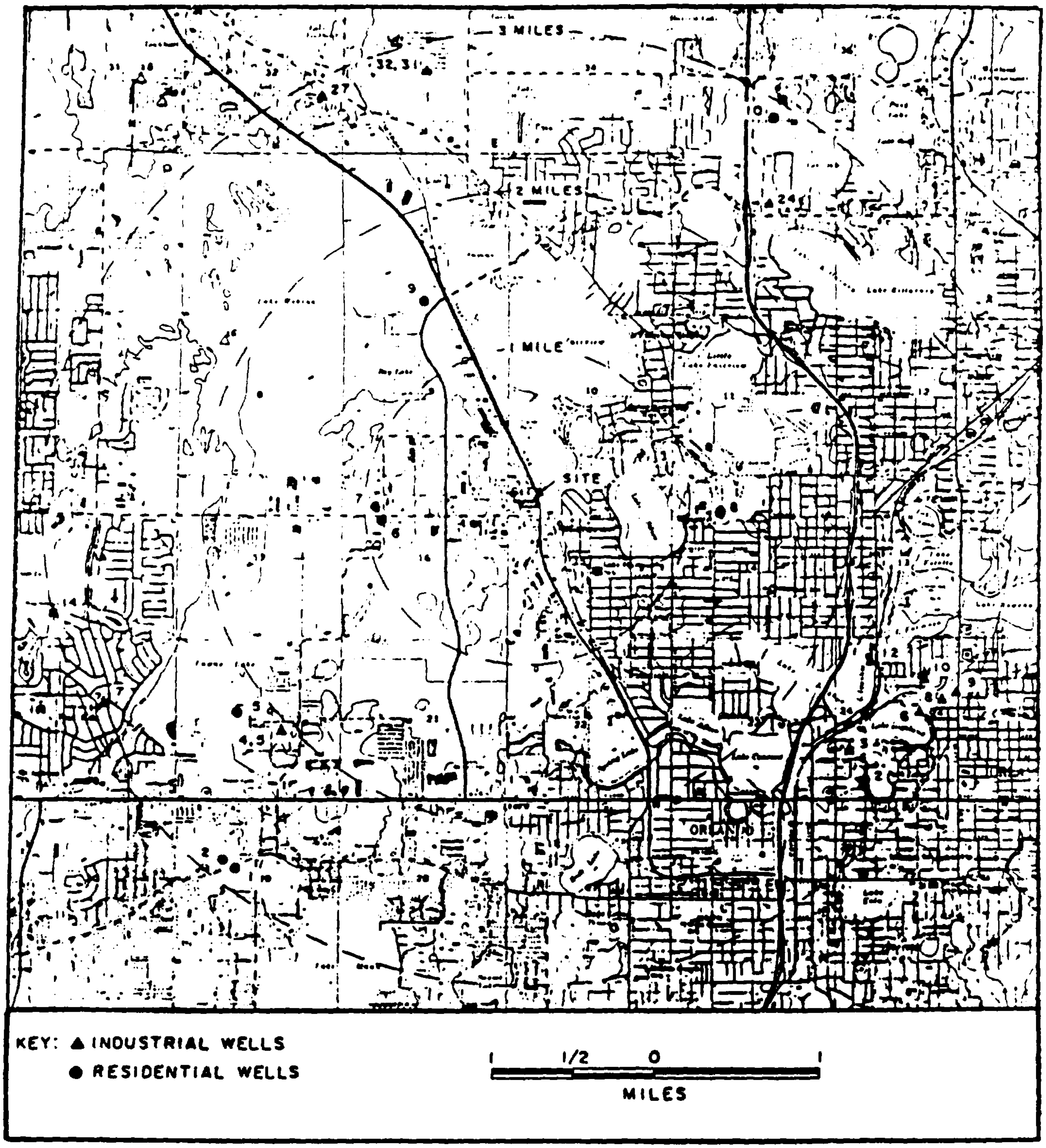


SITE VICINITY MAP



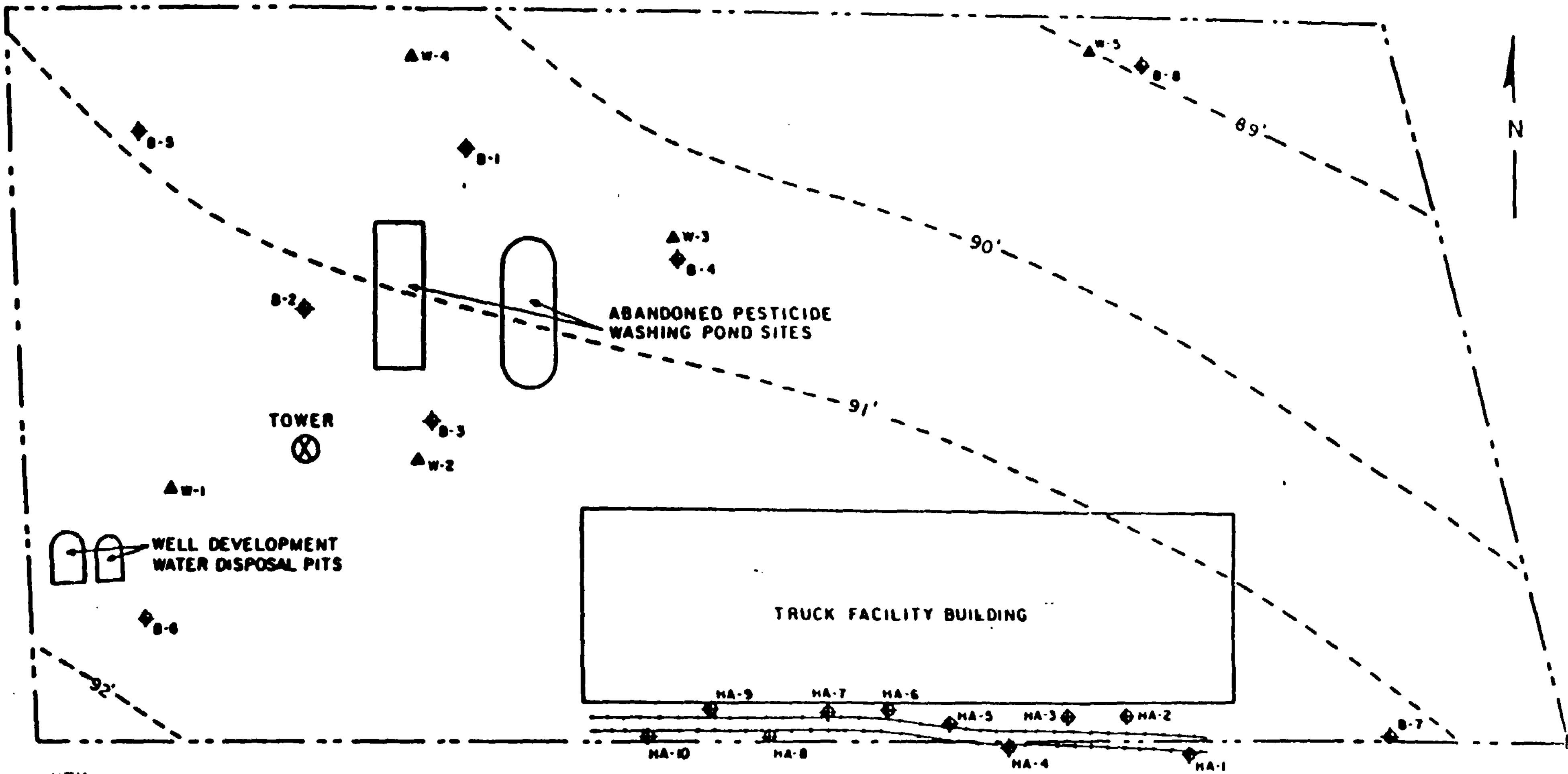
PLOT PLAN

21 0036



VICINITY WELL LOCATION MAP

Dames & Moore
Plate 3



KEY: - - - 90' - - -

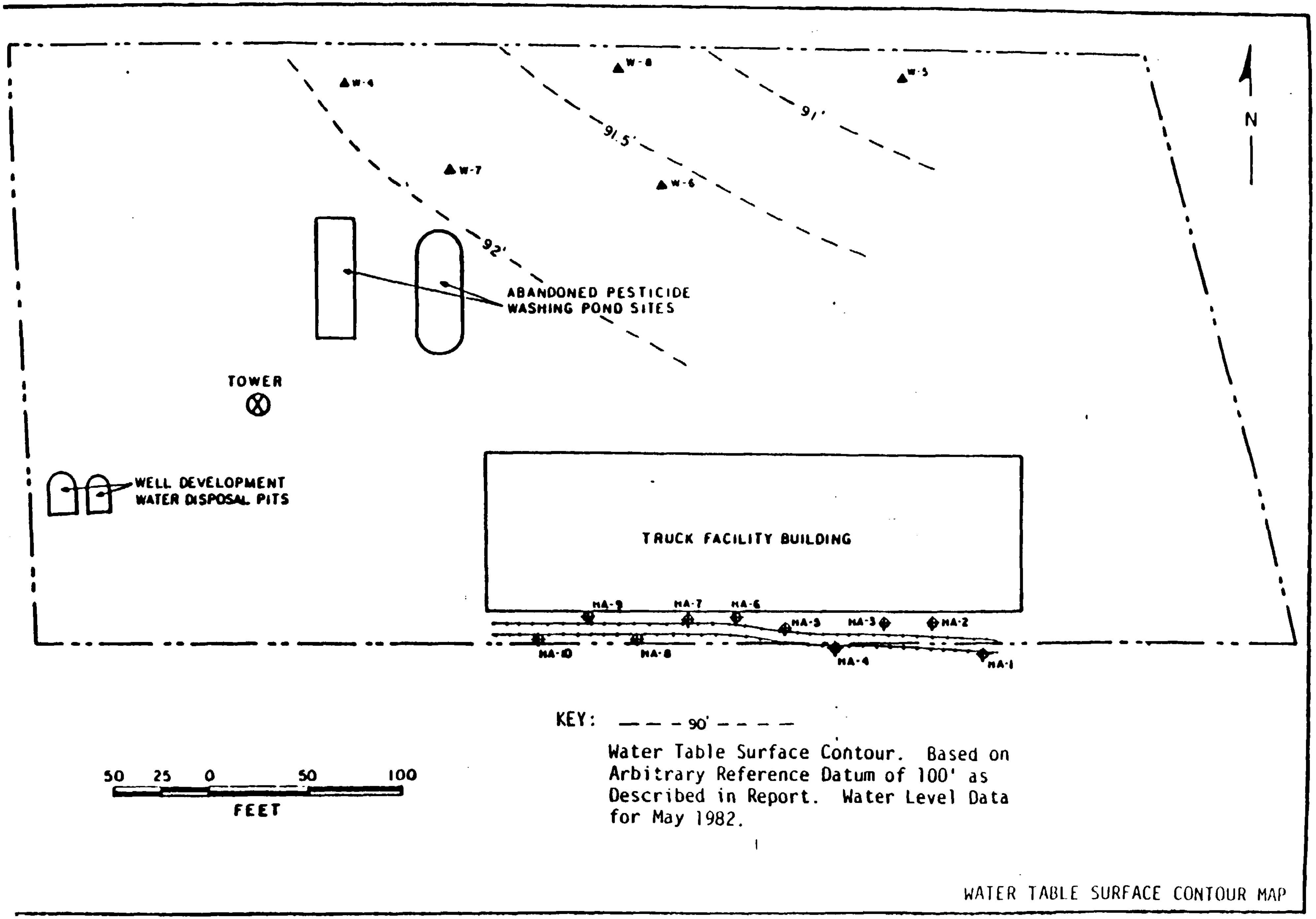
Water Table Surface Contour. Based on Arbitrary Reference Datum of 100' as Described in Report. Water Level Data for August 1981.

50 25 0 50 100
FEET

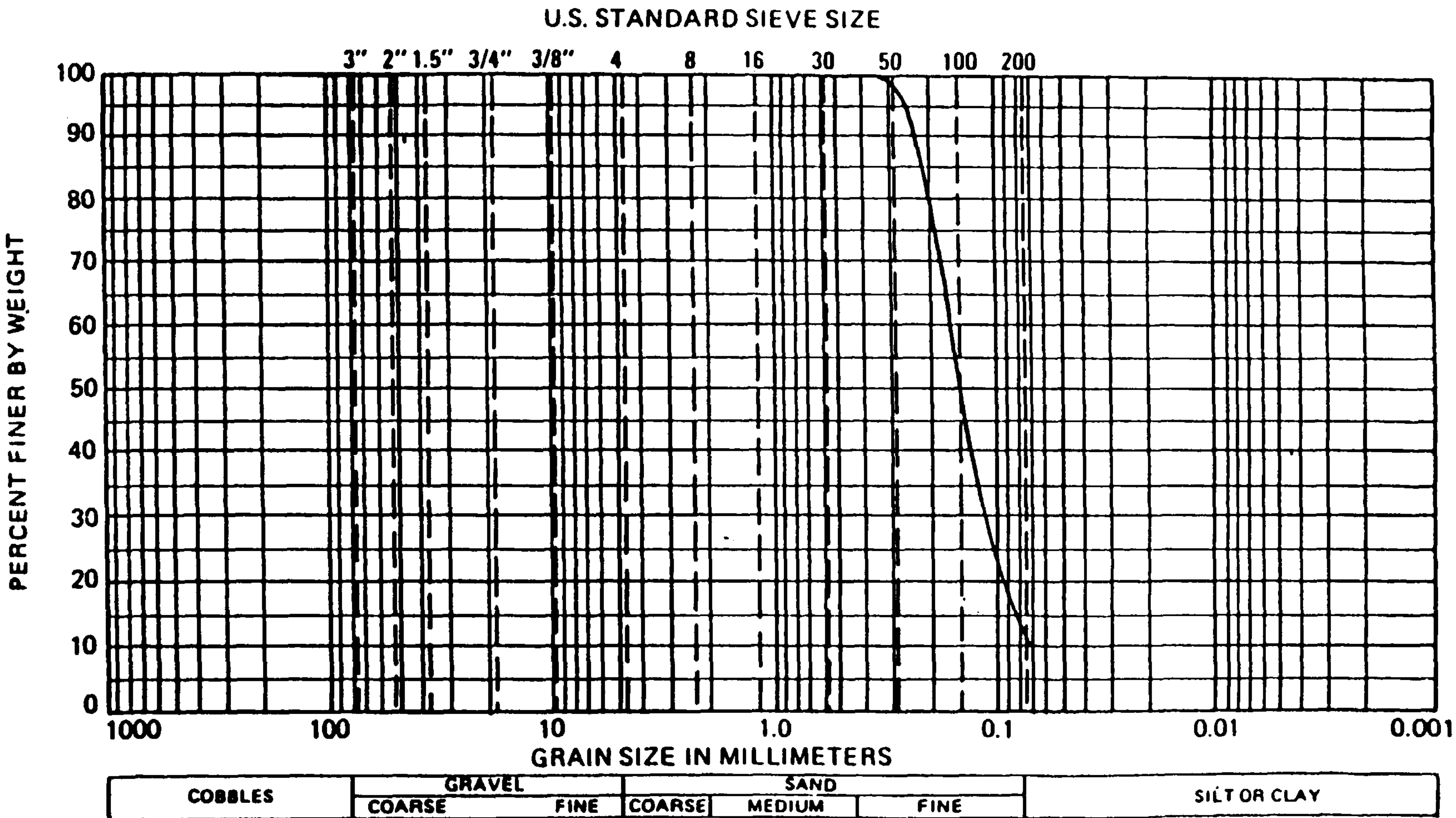
WATER TABLE SURFACE CONTOUR MAP

Dames & Moore

21 0038


W-4
W-8
W-5
W-7
W-6
91'
91.5'
92'
N
ABANDONED PESTICIDE
WASHING POND SITES
TOWER
WELL DEVELOPMENT
WATER DISPOSAL PITS
TRUCK FACILITY BUILDING
HA-9
HA-7
HA-6
HA-5
HA-3
HA-2
HA-10
HA-8
HA-4
HA-1
KEY: 90'
Water Table Surface Contour. Based on Arbitrary Reference Datum of 100' as Described in Report. Water Level Data for May 1982.
50 25 0 50 100
FEET
WATER TABLE SURFACE CONTOUR MAP

21 0039

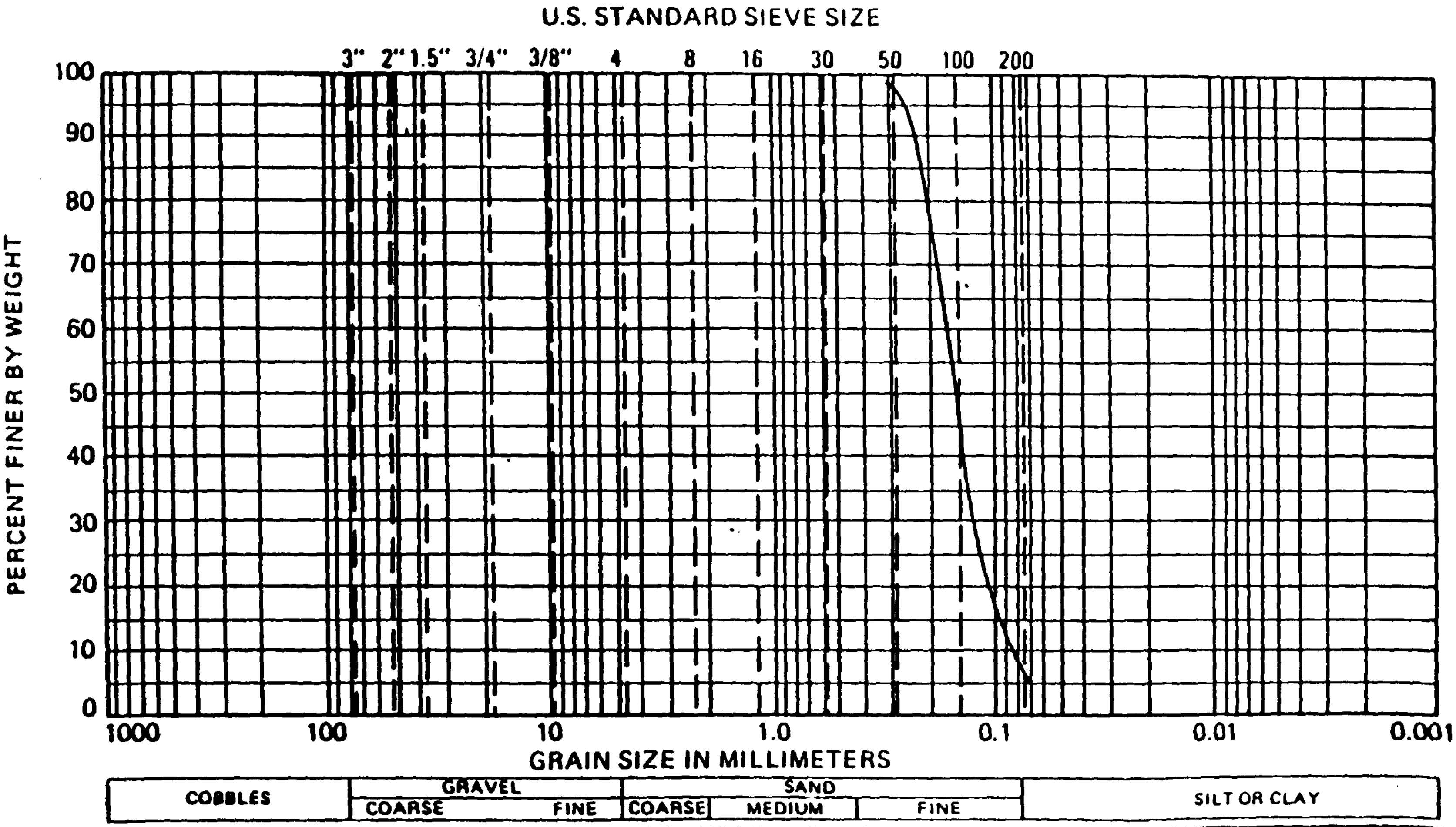


BORING B-3	DEPTH	CLASSIFICATION		NAT. W C	LL	PL	PI	
SAMPLE 6	15'-0"	SP	FINE TO VERY FINE SAND					

GRADATION CURVE

DAMES & MOORE

21 0040



BORING B-8	DEPTH	CLASSIFICATION		NAT. W C	LL	PL	PI	
SAMPLE 7	20'-0"	SP	FINE TO VERY FINE SAND					

GRADATION CURVE

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APPENDIX I

FIELD EXPLORATIONS AND BORING LOGS

The nine exploratory borings and eight monitoring wells were drilled with a truck-mounted CME-45 drill rig. The holes were advanced using 4-inch diameter augers above the water table and with a 4-inch diameter rotary wash bit below the water table. A bentonite drilling mud was used when necessary to prevent the boring side walls from caving. Following the acquisition of water level data, the borings were backfilled with sand and cement grout.

Samples of in-place soil were taken using a Standard Penetration Test split spoon, driven by a 140-pound hammer. These samples were placed in glass jars, capped with lids containing telflon seals. The samples were labeled for identification and shipped to the Dames & Moore office in Atlanta for storage. The samples will be retained for a period of one year from their date of acquisition unless Chevron Chemical Company requests an extended holding time.

Hand auger probes were advanced using a post hole digger and a hand auger. Soil samples collected were handled similar to those taken from the borings.

A qualified Dames & Moore engineer observed all pertinent field activities, identified the boring and well locations, selected depths for soil sample acquisition, obtained ground water samples, and maintained a log of each boring. The boring logs are included within this Appendix on Plates I-1 through I-17.

Between each boring or well all down hole equipment including drill rods, bits, augers, SPT split spoon and surface casing were cleaned to minimize potential for cross hole contamination. The three step cleaning procedure included steam cleaner rinse, rinse with hexane, and rinse with distilled water. The mud pump was rinsed internally with clean water between borings. The same cleaning procedures were applied during collection of the hand auger samples.

Monitoring Wells 1 through 5 were constructed by setting a 10-foot long, 2-inch diameter PVC well sreeen (.010 slot with 10 slots per foot) at a selected depth beneath the water table (see Table I-1), which was connected to the ground surface by 2-inch diameter PVC pipe. The annulus around the screen, to the approximate depth of the static water surface in the well, was packed with washed gravel. A 2 foot bentonite clay seal was placed on top of the gravel and the remainder of the annulus was filled with a cement grout slurry. A protective aluminum casing and cap was installed flush with the ground surface to protect the PVC pipe from damage. Monitoring Wells 6 through 8 are constructed as above except that a 20 foot PVC screen was used. Typical monitoring well construction details are shown on Plate I-14 in this appendix. Specific monitoring well construction details are presented on Table I-1.

The monitoring wells were developed by pumping after construction to remove drilling fluids and silt generated during drilling. Where necessary, water with high suspended solids was removed with a hand pump. The PVC pipe was then connected to the mud pump on the drill rig or a centrifugal pump and the well was pumped until clear water was obtained.

During the field explorations and monitoring well installations all drilling fluids, cuttings, water produced by developing the wells, and disposable personnel protective clothing used for the health and safety program were contained. The drilling fluids, cuttings and protective clothing were placed in five 55-gallon steel drums, sealed with a top band and cover, marked with a red paint line around the drum and stored in the southwest corner of the site. The water evolved during monitoring well development was placed in two pits (dug under the direction of the Dames & Moore field engineer) in the southwest corner of the site. Total pit volume was approximately 120 cubic feet. The condition of the drums and pits were as described herein when the Dames & Moore field engineer left the site on 8 May 1982.

Elevations and locations of the exploratory borings and monitoring wells were surveyed by Dames & Moore engineers using a precision level equipped with an azmuth circle, and a steel tape. The elevation data are presented on Tables I-2 and I-2A. The elevations of the water levels measured in the borings and wells are also recorded on Tables I-2 and I-2A. An arbitrary datum of 100 feet was assigned and the elevations recorded are relative to this datum. The datum point used was the too of the valve nut on a fireplug at the northwest corner of the truck repair building.

Constant head permeability tests were run in the field at Wells W-2, W-5, and W-7. A known flow of water was introduced into the well and continued until a equilibrium was reached for a constant water head (above ground water level) at a constant flow rate. Permeability was calculated using the following formula:

$$K_h = \frac{q \cdot \ln \left[\frac{mL}{D} + \sqrt{1 + \left(\frac{mL}{D}\right)^2}\,\right]}{2 \cdot \quad \cdot L \cdot He}$$

Where: K_h = horizontal permeability (cm/sec)

q = flow of water (cm^3/sec)

m = transformation ratio (i.e., square root of horizontal permeability over vertical permeability and assumed to be one)

L = intake length (cm)

D = intake diameter (cm)

He = height of constant head above ground water level (cm).

This method is referenced in Soi Mechanics by Lambe and Whitman.

Samples of ground water were taken from the five monitoring wells for chemical anslysis. The sampling methodology was in accordance with existing standards. The wells were evacuated of at least 3 casing volumes of water using a hand bailer or mechanical pump. Samples were collected using a PVC bailer which was washed with clean water between its use in each well. Samples for each well were placed in prepared containers provided by the laboratory. Glass with teflon top seals and plastic containers were used and each container was filled to exclude air space. The laboratory selected aliquots from each container, as appropriate for the parameter(s) analyzed, with respect to volume of sample and container compatibility. Sample containers were labeled, placed in ice-filled chests, and transported to the laboratory by the Dames & Moore field engineer. An elapsed time of less than 20 hours accrued from sample removal from the wells to delivery to the laboratory. No preservatives were added to the samples since transport time to the laboratory was minimal.

The field explorations were conducted under a Dames & Moore Health and Safety Plan designed to prevent exposure of personnel to health threatening substances or conditions. A job specific Standard Operating Procedure was developed based on the list of chemical compounds, as supplied by the Chevron Chemical Company, which potentially could be encountered during field explorations and sampling operations. The Standard Operating Procedure outlines specific work practices to minimize potential exposure, and profiles odors and physical sensations associated with exposure to the listed compounds.

Disposable protective coveralls, rubber boots, and rubber gloves were supplied to field personnel to prevent their contact with drilling fluids and cuttings. This program was implemented by the field engineer and Atlanta Dames & Moore Office Safety Coordinator.

TABLE I-1

MONITORING WELL CONSTRUCTION DETAILS

Well No.	Depth* (ft)	Diameter (in)	Well Screen Depth Interval (ft)	Gravel Pack Length (ft)	Bentonite Seal (ft)
1	20	2	10	12	2
2	20	2	10-20	12	2
3	20	2	10-20	12	2
4	20	2	10-20	12	2
5	25	2	15-25	16	2
6	37	2	17-37	30	2
7	30	2	10-30	20	2
8	30	2	10-30	20	2

*To bottom of screen.

TABLE I-2

BORING, WELL, AND GROUND WATER ELEVATIONS

Boring	Ground/Top of PVC-Ele.* (ft)	Elevation of Water Level (ft) 7/2/81	Elevation of Water Level (ft) 7/27/81
B-1	97.66	95.95**	95.08**
B-2	97.57	90.78	---
B-3	97.67	90.90	91.34
B-4	97.20	90.22	90.49
B-5	96.67	90.44	90.84
B-6	97.97	91.14	91.55
B-7	99.15	88.32	91.15
B-8	98.35	86.43	89.02

Well	Ground/Top of PVC-ELE.* (ft)	Elevation of Water Level (ft) 8/4/81
W-1	97.12	91.37
W-2	98.07	91.40
W-3	97.51	90.59
W-4	97.01	90.43
W-5	98.10	88.93

*Elevations are based on an arbitrary common datum point of 100 feet. The datum point is the top of the valve nut on a fire hydrant located at the northwest corner of the truck facility building.

**Elevations inaccurate due to plugging of well screen with silt.

TABLE I-2A

WELL AND GROUND WATER ELEVATIONS

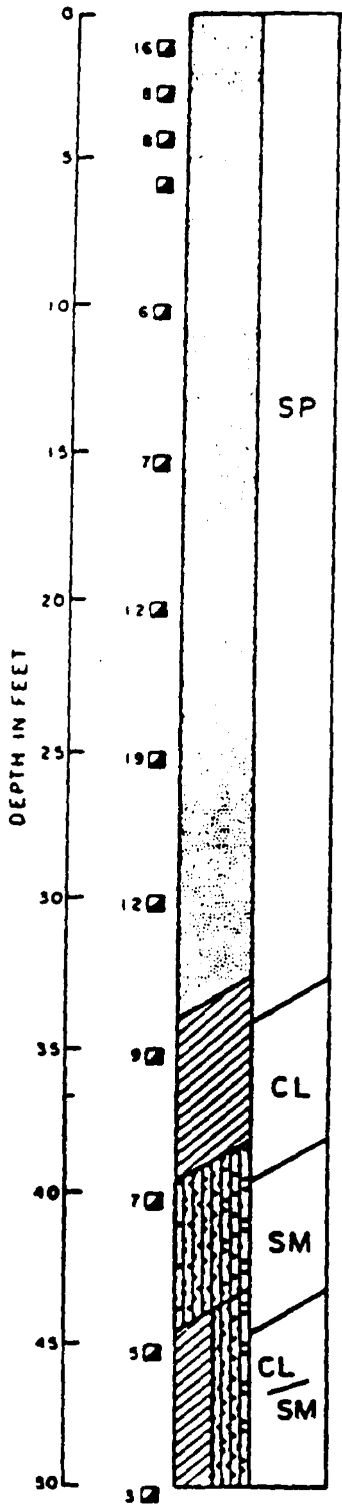
Well	Ground/Top of PVC-Ele.* (ft)	Elevation of Water Level (ft)		
		5/6/82	5/7/82	5/8/82
W-4	97.01	--	91.80	91.92
W-5	98.10	--	90.79	90.64
W-6	97.86	91.77	--	91.61
W-7	97.94	--	91.88	91.84
W-8	97.43	91.43	--	91.37

*Elevations are based on an arbitrary common datum point of 100 feet. The datum point is the top of the valve nut on a fire hydrant located at the northwest corner of the truck facility building.

BORING B-1

ELEVATION: 97.66'

SYMBOLS DESCRIPTIONS



BROWN FINE QUARTZ SAND, STRONG PESTICIDE ODOR
(MEDIUM DENSE)
(LOOSE)
GRADES DARK BROWN (LOOSE)
GRADES LIGHT BROWN (MOIST)
STRONG PESTICIDE ODOR

STRONG PESTICIDE ODOR

STRONG PESTICIDE ODOR

TRACE OF SHELLS AND STRONG PESTICIDE ODOR

SLIGHT DECREASING PESTICIDE ODOR

GRADES LIGHT BROWN WITHOUT PESTICIDE ODOR

GRADES WITH ALTERNATING LAYERS OF GRAY SILTY CLAY AND FINE QUARTZ SAND

GRAY SILTY CLAY AND FINE QUARTZ SAND
(SOFT TO MEDIUM STIFF)

GRAY SLIGHTLY SILTY SAND (LOOSE)

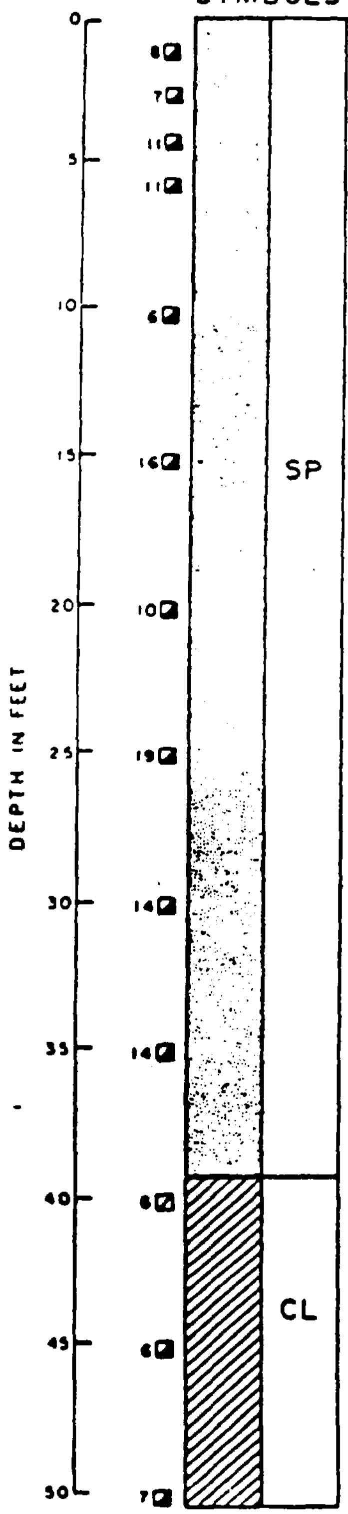
ALTERNATING LAYERS OF GRAY CLAY AND SILTY SAND (LOOSE)

(VERY LOOSE)
BORING TERMINATED AT 50' ON 6/29/81

BORING B-2

ELEVATION: 97.57'

SYMBOLS DESCRIPTION



BROWN FINE QUARTZ SAND WITHOUT PESTICIDE ODOR (LOOSE)

(MEDIUM DENSE)

SOME PESTICIDE ODOR (LOOSE)

GRADES GRAY WITH SOME PESTICIDE ODOR (MEDIUM DENSE)

GRADES BROWNISH GRAY WITH SOME SILT (LOOSE)

SOME PESTICIDE ODOR (MEDIUM DENSE)

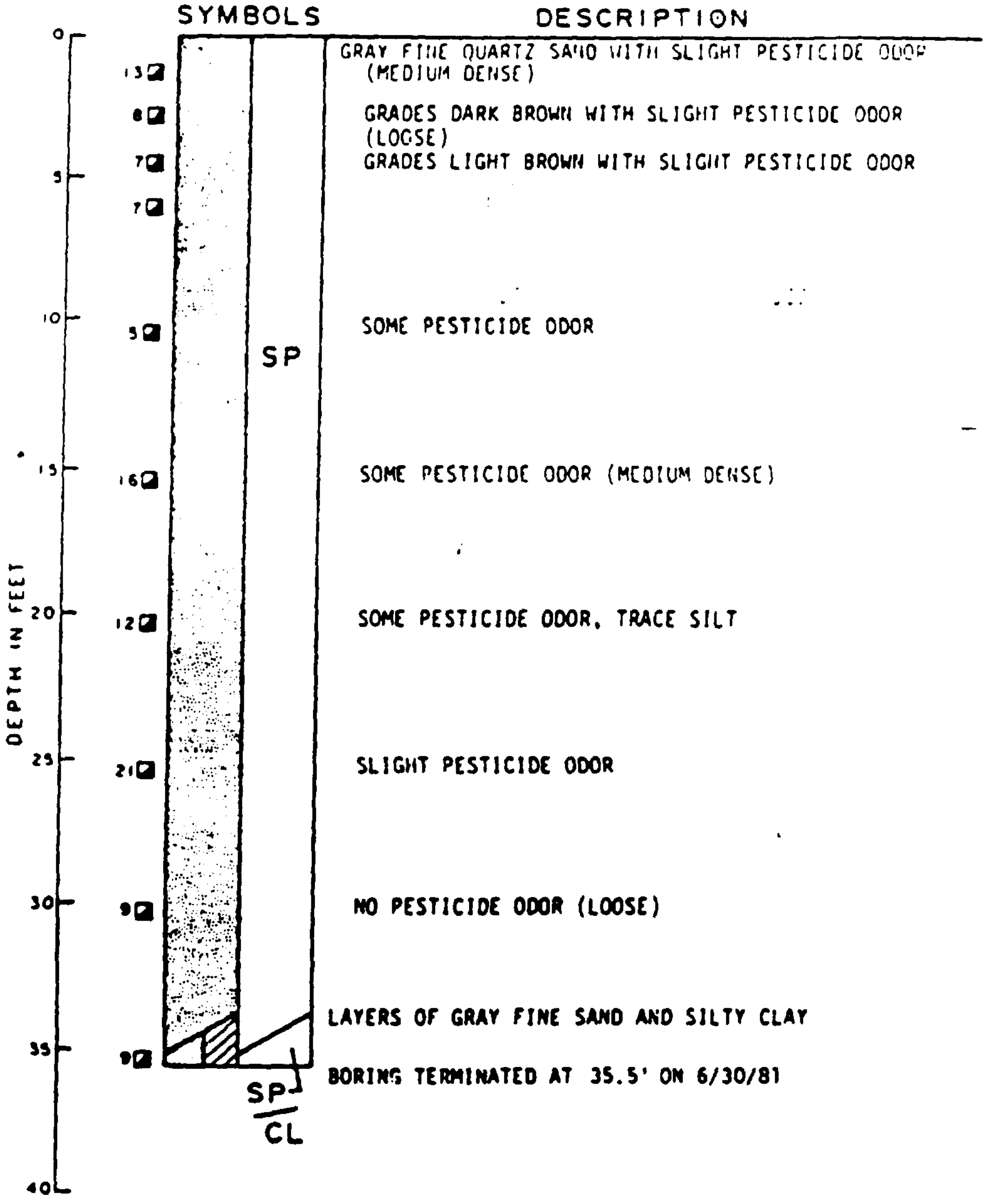
SLIGHT PESTICIDE ODOR

GRAY SILTY CLAY, NO PESTICIDE ODOR (SOFT TO MEDIUM STIFF)

BORING TERMINATED AT 50.5' ON 6/30/81

BORING B-3

ELEVATION: 97.67'



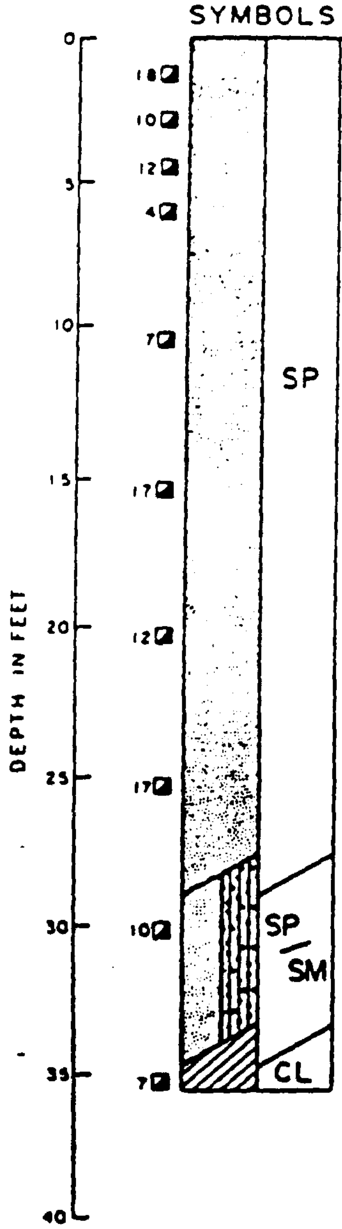
LOG OF BORING

DAMES & MOORE

BORING B-4

ELEVATION: 97.20'

SYMBOLS - DESCRIPTION



BLACK FINE QUARTZ SAND, SLIGHT OIL ODOR
(MEDIUM DENSE)

GRADES GRAY AND BLACK WITH STRONG PESTICIDE ODOR

SLIGHT PESTICIDE ODOR (LOOSE)

GRADES BLACK WITH TRACE OF SILT AND STRONG PESTICIDE ODOR

GRADES WHITE WITH MODERATE PESTICIDE ODOR
(MEDIUM DENSE)

GRADES GRAY WITH STRONG PESTICIDE ODOR

GRADES GRAYISH BROWN WITH SLIGHT PESTICIDE ODOR

VERY FINE QUARTZ SAND WITH SOME SILT AND WITHOUT PESTICIDE ODOR
(LOOSE)

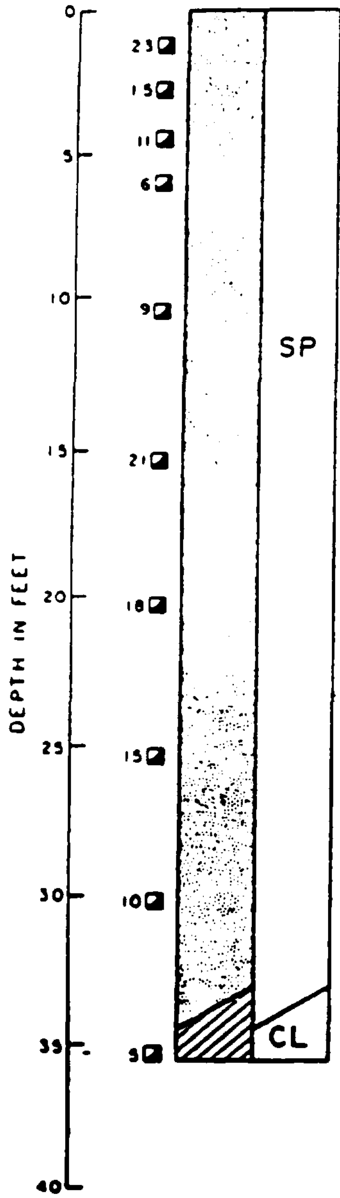
GRAYISH BLACK SILTY CLAY WITH SPOTS OF ORANGE, NO PESTICIDE ODOR
(STIFF)

BORING TERMINATED AT 35.5' ON 6/30/81

BORING B-5

ELEVATION: 96.67'

SYMBOLS DESCRIPTION



DARK BROWN FINE QUARTZ SAND WITH TRACE OF SILT AND SLIGHT OIL ODOR (MEDIUM DENSE)

GRADES LIGHT BROWN, NO PESTICIDE ODOR

GRADES WITH SPOTS OF BLACK, SLIGHT PESTICIDE ODOR (LOOSE)

GRADES DARK BROWN WITH SLIGHT PESTICIDE ODOR

GRADES BROWN TO TAN, SLIGHT TO NO PESTICIDE ODOR (MEDIUM DENSE)

MODERATE PESTICIDE ODOR

GRADES TAN TO GRAY, SLIGHT PESTICIDE ODOR

GRADES SLIGHTLY SILTY, NO PESTICIDE ODOR (LOOSE)

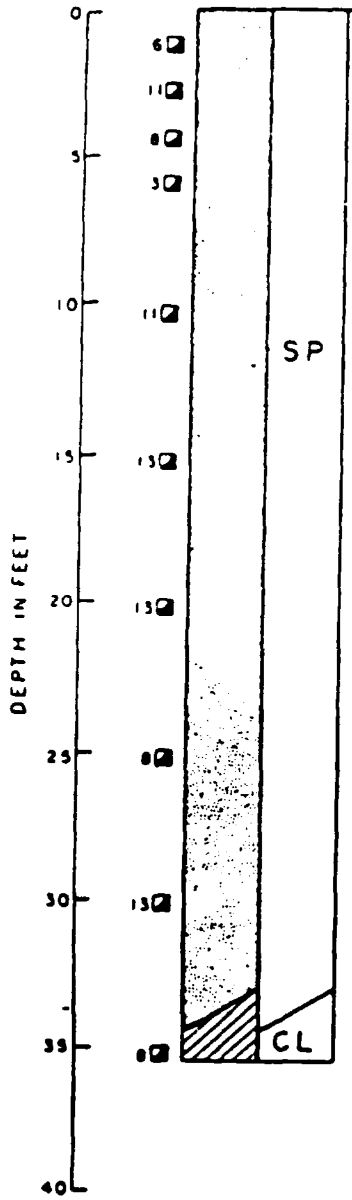
DARK GRAY SILTY CLAY WITH SOME QUARTZ SAND (SOFT)

BORING TERMINATED AT 35.5' ON 7/1/81

BORING B-6

ELEVATION: 97.97'

SYMBOLS — DESCRIPTION



BLACK AND GRAY FINE QUARTZ SAND, NO PESTICIDE ODOR
(LOOSE)

GRADES BROWN
(MEDIUM DENSE)
(LOOSE)

TRACE OF SILT

GRADES LIGHT BROWN
(MEDIUM DENSE)

SLIGHT PESTICIDE ODOR

SLIGHT PESTICIDE ODOR

SLIGHT PESTICIDE ODOR
(LOOSE)

SLIGHT PESTICIDE ODOR
(MEDIUM DENSE)

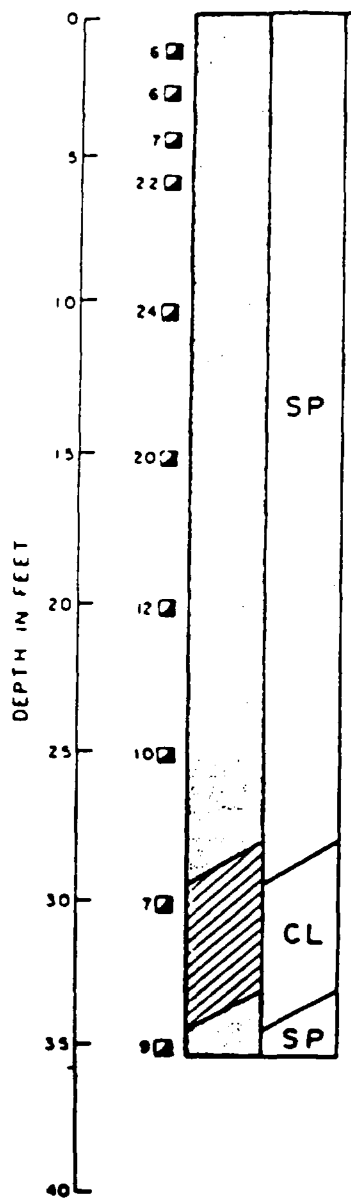
GRAYISH BLACK SILTY CLAY WITH SOME FINE QUARTZ SAND, NO PESTICIDE ODOR
(MEDIUM STIFF)

BORING TERMINATED AT 35.5' ON 7/1/81

BORING B-7

ELEVATION: 99.15'

SYMBOLS | DESCRIPTION



GRAY FINE QUARTZ SAND
(LOOSE)
GRADES WHITE

GRADES WHITE AND BROWN

GRADES DARK BROWN WITH TRACE OF SILT, VERY SLIGHT PESTICIDE ODOR
(MEDIUM DENSE)

VERY SLIGHT PESTICIDE ODOR

GRADES LIGHT BROWN, NO PESTICIDE ODOR

(LOOSE)

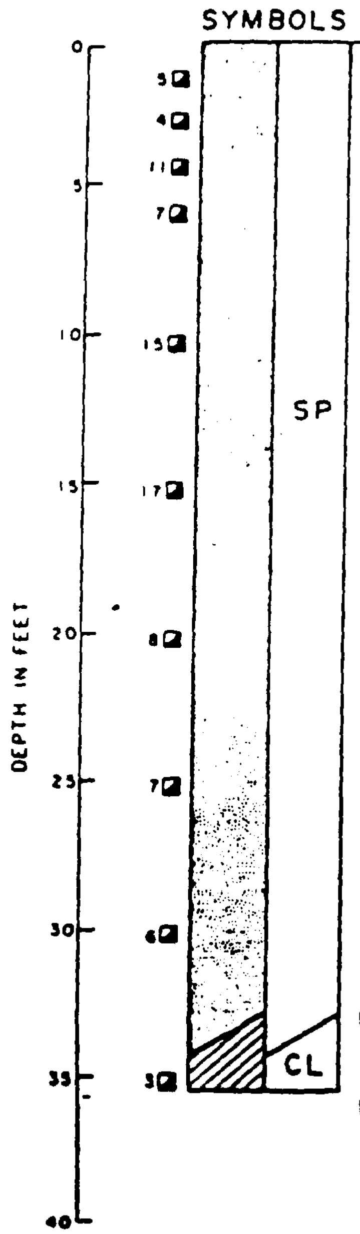
DARK GRAY SILTY CLAY
(SOFT)

LIGHT BROWN FINE QUARTZ SAND

BORING TERMINATED AT 35.5' ON 7/1/81

BORING B-8

ELEVATION: 98.35'



DESCRIPTION

DARK BROWN FINE QUARTZ SAND
(LOOSE)
NO PESTICIDE ODOR
(VERY LOOSE)
GRADES WHITE (MEDIUM DENSE)
(LOOSE)

TRACE OF SILT
(MEDIUM DENSE)

GRADES WHITE AND BROWN

GRADES WHITE
(LOOSE)

SLIGHT SILT CONTENT

LIGHT GRAY SILTY CLAY WITH SOME FINE QUARTZ SAND
(SOFT)

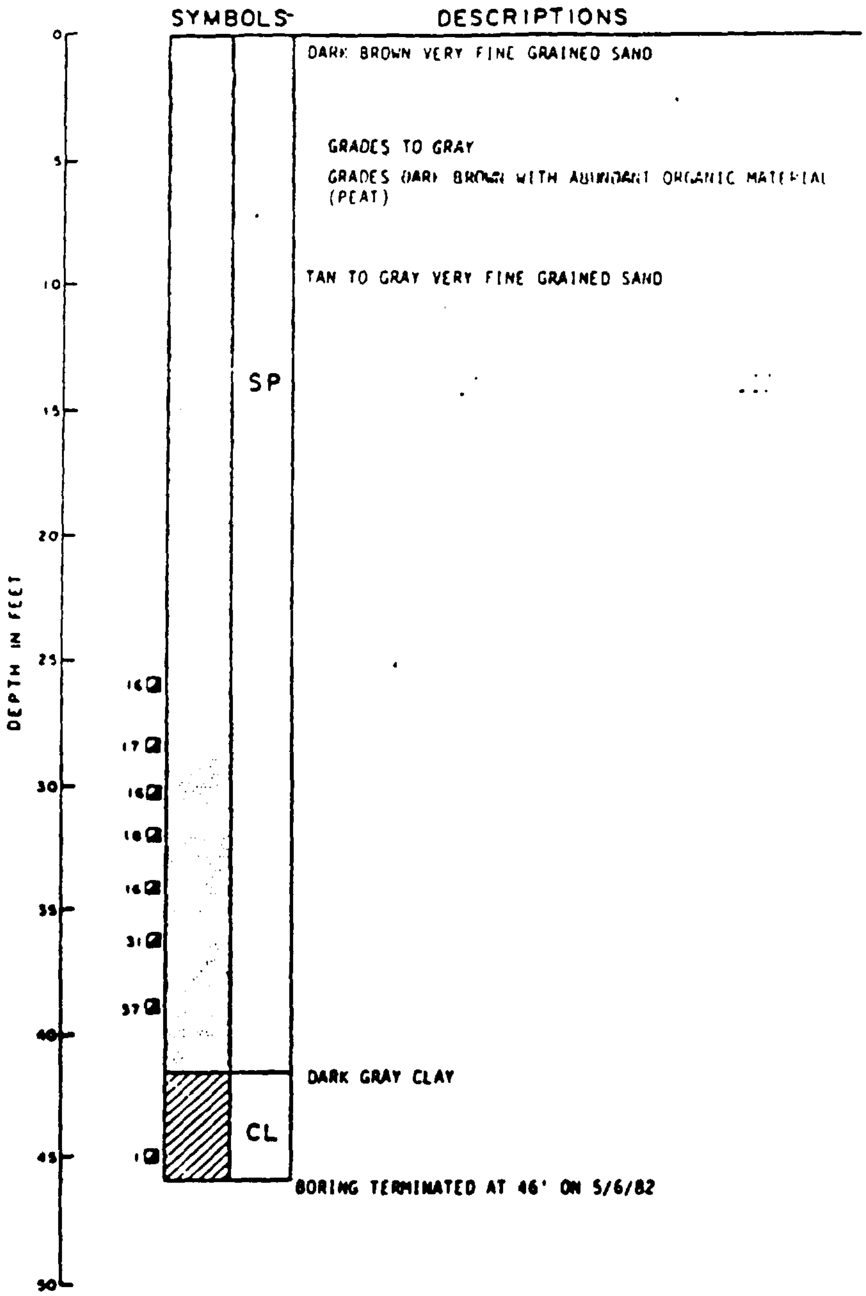
BORING TERMINATED AT 35.5' ON 7/1/81

LOG OF BORING

DAMES & MOORE

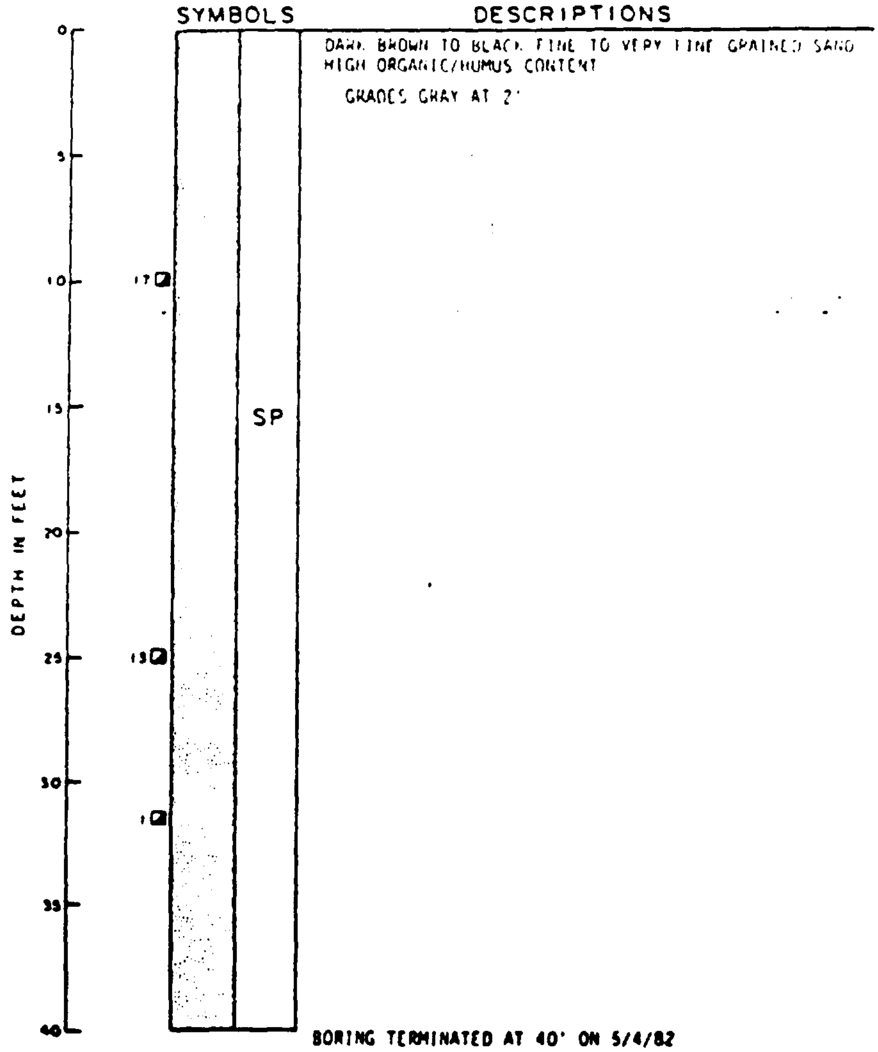
BORING B-9

ELEVATION: 97.06'



WELL W-6

ELEVATION: 9786'

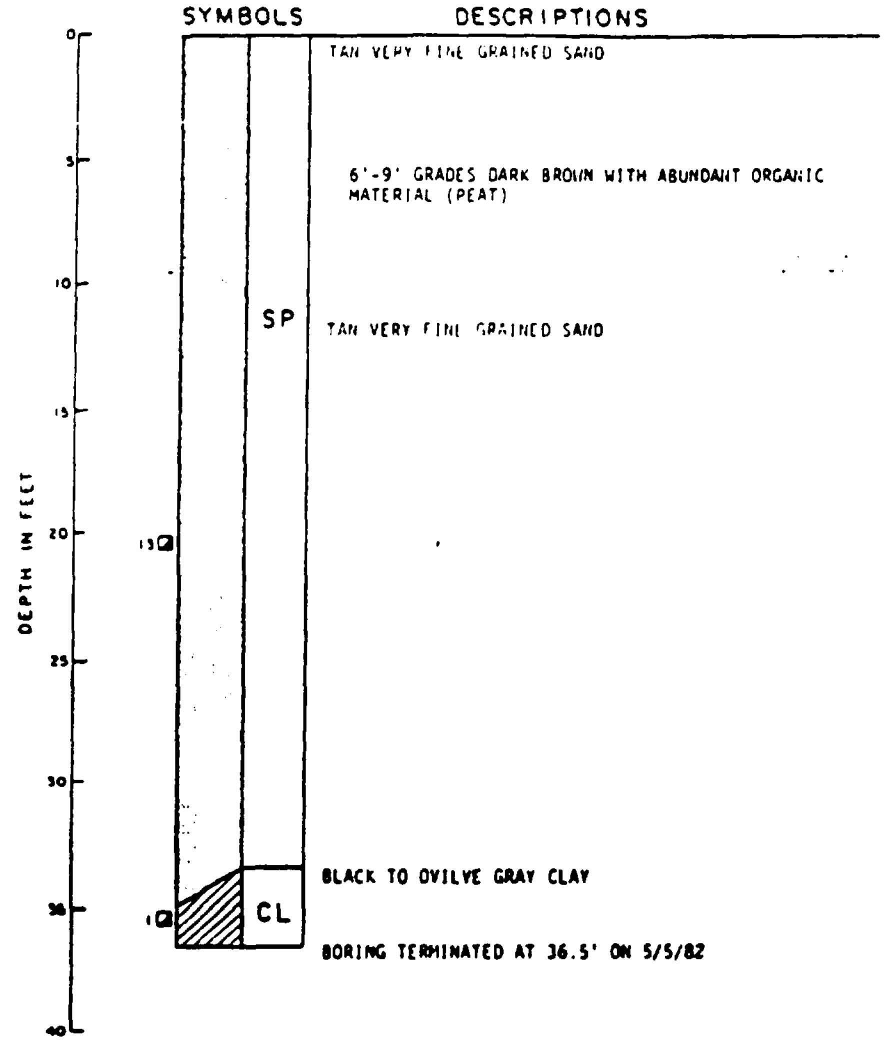


LOG OF WELL

DAMES & MOORE

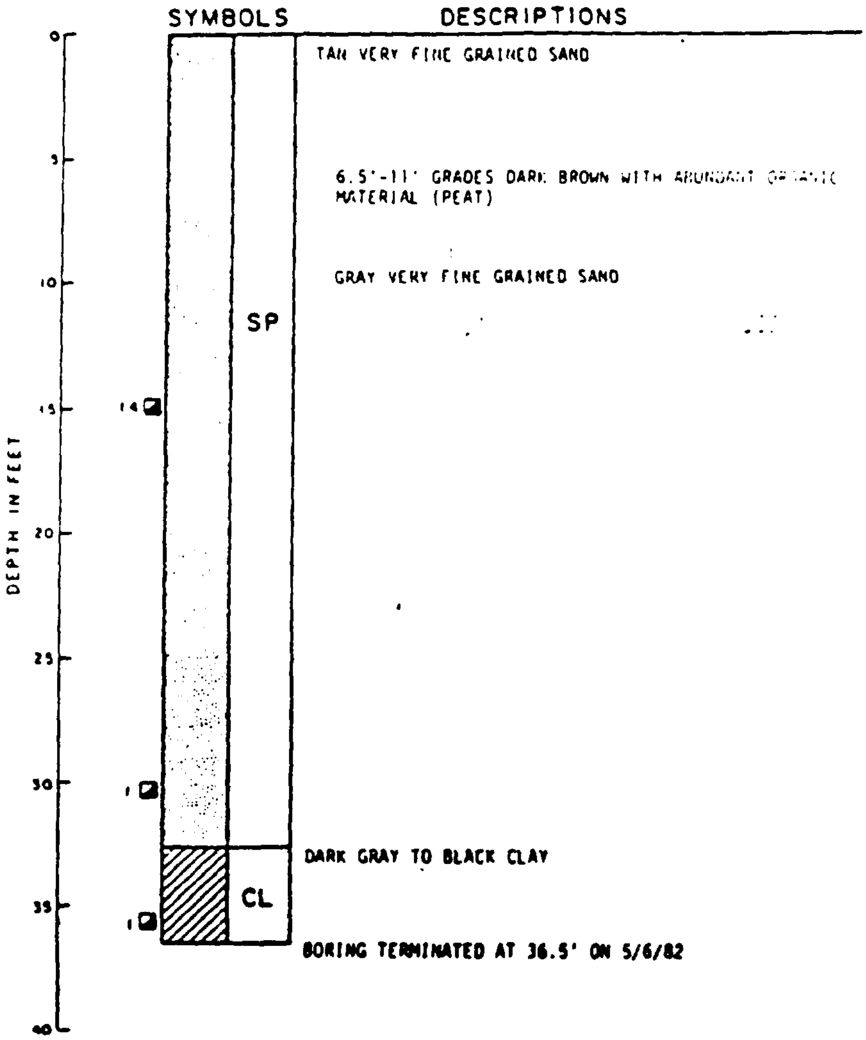
WELL W-7

ELEVATION: 97.94±



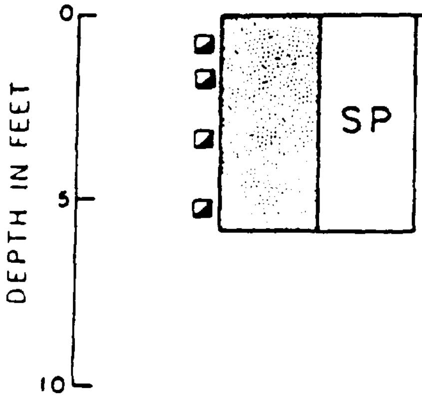
WELL W-8

ELEVATION: 97.43'



PROBE HA-1

SYMBOLS DESCRIPTION



BROWN FINE QUARTZ SAND, VERY SLIGHT PESTICIDE ODOR
NO PESTICIDE ODOR

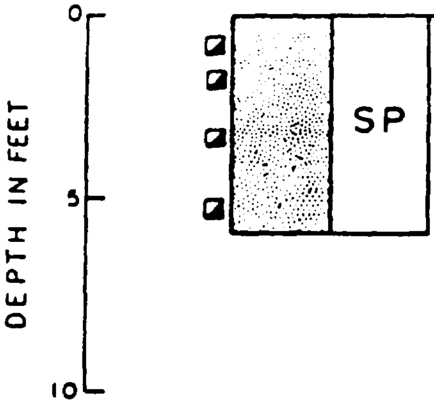
GRADES WHITE

GRADES BROWN

PROBE TERMINATED AT 5.5' ON 8/30/81
WATER NOT ENCOUNTERED

PROBE HA-2

SYMBOLS DESCRIPTION



WHITE AND BROWN FINE QUARTZ SAND, SLIGHT PESTICIDE ODOR

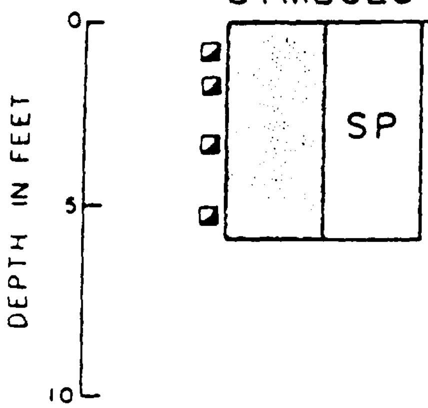
GRADES WHITE, VERY SLIGHT PESTICIDE ODOR

GRADES BROWN

PROBE TERMINATED AT 5.5' ON 8/30/81
WATER NOT ENCOUNTERED

PROBE HA-3

SYMBOLS — DESCRIPTION



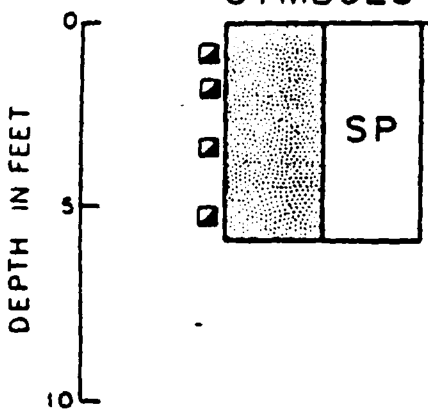
BLACK FINE QUARTZ SAND, SLIGHT PESTICIDE ODOR

GRADES WHITE WITH BLACK SPOTS

PROBE TERMINATED AT 5.5' ON 8/30/81
WATER NOT ENCOUNTERED

PROBE HA-4

SYMBOLS — DESCRIPTION



BLACK FINE QUARTZ SAND, NO PESTICIDE ODOR
GRADES BROWNISH GRAY, SLIGHT PESTICIDE ODOR

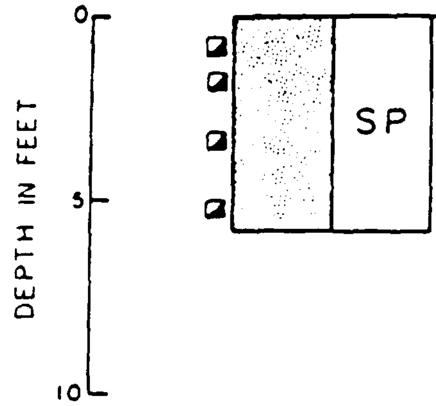
GRADES WHITE WITH BLACK SPOTS, SLIGHT PESTICIDE ODOR

GRADES BROWN WITH SOME WHITE, VERY SLIGHT PESTICIDE ODOR

PROBE TERMINATED AT 5.5' ON 8/30/81
WATER NOT ENCOUNTERED

PROBE HA-5

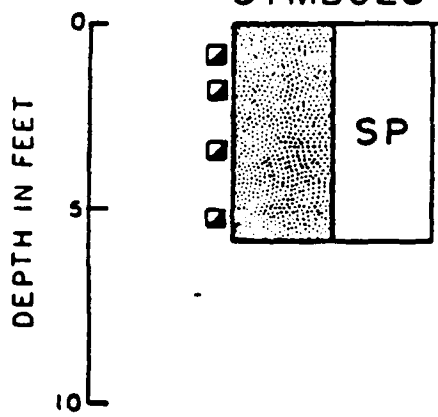
SYMBOLS — DESCRIPTION



BROWN FINE QUARTZ SAND
GRADES WHITE, SLIGHT PESTICIDE ODOR
GRADES BLACK AND BROWN, SLIGHT PESTICIDE ODOR
GRADES WHITE, VERY SLIGHT PESTICIDE ODOR
PROBE TERMINATED AT 5.5' ON 8/30/81
WATER NOT ENCOUNTERED

PROBE HA-6

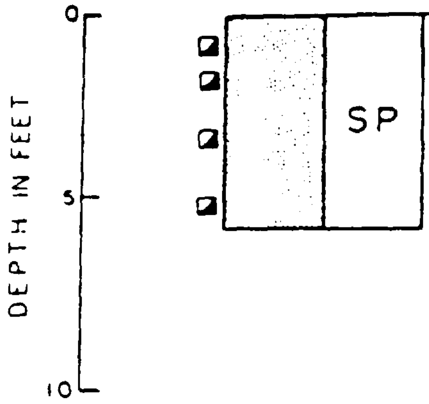
SYMBOLS — DESCRIPTION



ASPHALT (1/4")
BROWN FINE QUARTZ SAND WITH SOME ORGANICS, SOME PESTICIDE ODOR
GRADES WITHOUT ORGANICS, NO PESTICIDE ODOR
GRADES WHITE, SLIGHT PESTICIDE ODOR
PROBE TERMINATED AT 5.5' ON 8/31/80
WATER NOT ENCOUNTERED

PROBE HA-7

SYMBOLS DESCRIPTION



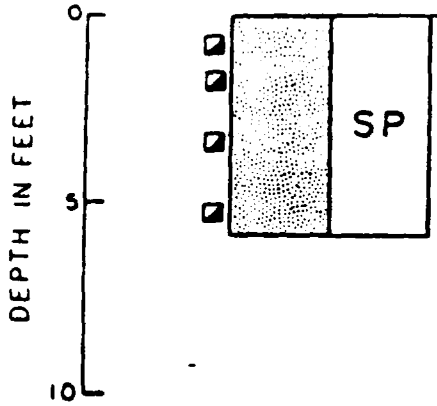
BROWN FINE QUARTZ SAND, SOME PESTICIDE ODOR

GRADES WHITE, SLIGHT PESTICIDE ODOR

PROBE TERMINATED AT 5.5' ON 8/31/81
WATER NOT ENCOUNTERED

PROBE HA-8

SYMBOLS DESCRIPTION



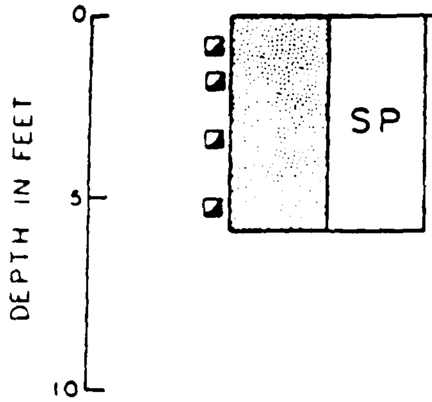
DARK BROWN FINE QUARTZ SAND, SOME PESTICIDE ODOR

GRADES LIGHT BROWN, SLIGHT PESTICIDE ODOR

PROBE TERMINATED AT 5.5' ON 8/31/81

PROBE HA-9

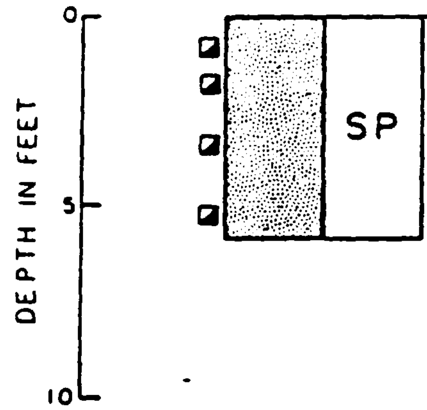
SYMBOLS DESCRIPTION



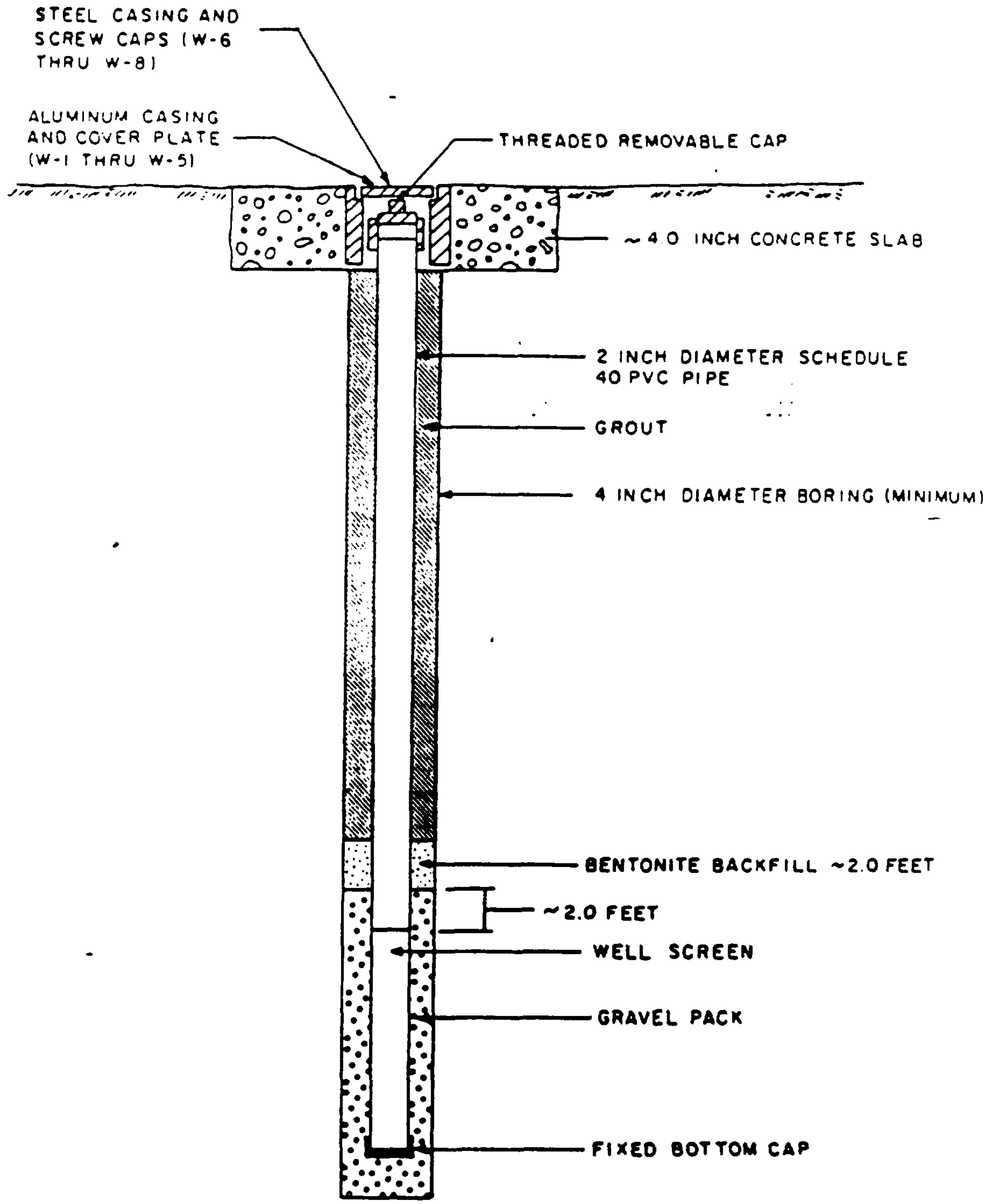
BLACK FINE QUARTZ SAND, SLIGHT OIL ODOR
SOME PESTICIDE ODOR
SLIGHT PESTICIDE ODOR
GRADES WHITE
PROBE TERMINATED AT 5.5' ON 8/31/81
WATER NOT ENCOUNTERED

PROBE HA-10

SYMBOLS DESCRIPTION



BLACK FINE QUARTZ SAND, NO PESTICIDE ODOR
GRADES GRAY, SLIGHT PESTICIDE ODOR
NO PESTICIDE ODOR
PROBE TERMINATED AT 5.5' ON 8/31/81
WATER NOT ENCOUNTERED



NOT TO SCALE

TYPICAL CONSTRUCTION
DETAIL MONITORING WELL

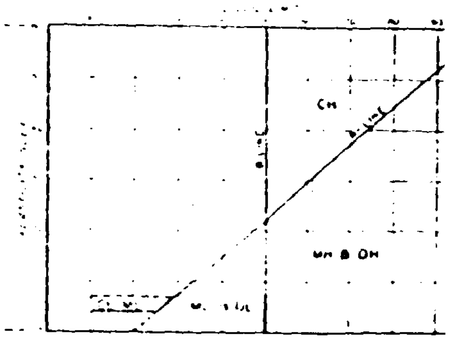
DAMES & MOORE

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS	GRAPH SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
[illegible]		GW	[illegible]
[illegible]		GP	[illegible]
[illegible]		GM	[illegible]
[illegible]		GC	[illegible]
[illegible]		SW	[illegible]
[illegible]		SP	[illegible]
[illegible]		SM	[illegible]
[illegible]		SC	[illegible]
[illegible]		ML	[illegible]
[illegible]		CL	[illegible]
[illegible]		OL	[illegible]
[illegible]		MH	[illegible]
[illegible]		CH	[illegible]
[illegible]		OH	[illegible]
[illegible]		PT	[illegible]

SOIL CLASSIFICATION CHART

GRADATION CHART



PLASTICITY CHART

NOTES

[illegible]

21 0068

APPENDIX II

CHEMICAL ANALYSES DATA

Results of analysis of ground water and soil samples are presented in this appendix. Ground water samples were collected from Monitoring Wells W-1, W-2, W-3, W-4, W-5, W-6, W-7, and W-8. Analysis of these samples are presented in Tables II-1 and II-1A. Soil samples were collected from Borings B-1, B-3, and B-4. Analysis of these samples are presented in Table II-2.

Ground water samples and soil samples were analyzed in accordance with methods presented in FR Vol. 43, No. 243, 18 December 1978 and FR Vol. 45, No. 98, 19 May 1980. Soil samples were first subjected to Toxic Extraction Procedures and then the extracted liquid was analyzed. These methods are accepted by the USEPA for chemical analysis of samples associated with RCRA projects.

The samples were handled under a formal Chain of Custody procedure. This establishes documentation to trace sample possession from the time of collection through the analysis procedures. The completed Chain of Custody forms are retained in Dames & Moore's job files.

Orlando Laboratories, Inc. of Orlando, Florida was contracted to analyze the samples. Orlando Laboratories, Inc. has extensive experience in ground water and general environmental service analysis. They are certified by the Florida Department of Health and Rehabilitation Services (Identification No. 83141). The lab maintains an active quality control program and participates in FDER Round Robbins and performance evaluation studies. Additionally, the quality control program is complemented by use of USEPA Quality Control Samples.

TABLE II-1

CHEMICAL ANLAYSIS OF GROUND WATER SAMPLES
COLLECTED AUGUST 1981
(Expressed in mg/l unless otherwise designated)

Page 1 of 2

Analysis f Parameters	Sample W-1	Sample[a] W-2	Sample[a] W-3	Sample[b] W-4	Sample[a] W-5
DDT	<0.001	<0.001	<0.001	<0.001	<0.001
Chlordane	0.001	<0.001	0.644	<0.001	<0.001
Toxaphene	<0.001	<0.001	<0.001	<0.001	<0.001
Endrin	<0.001	<0.001	<0.001	<0.001	<0.001
Dieldrin	<0.001	<0.001	<0.001	<0.001	<0.001
Aldrin	<0.001	<0.001	<0.001	<0.001	<0.001
Heptachlor	<0.001	<0.001	<0.001	<0.001	<0.001
Lindane	<0.001	<0.001	0.026	<0.001	<0.001
DDD-o,p'	<0.001	<0.001	0.224	<0.001	<0.001
DDD-p,p'	0.006	<0.001	0.878	<0.001	<0.001
Captan	<0.001	<0.001	<0.001	<0.001	<0.001
Parathion	<0.01	<0.01	<0.01	<0.01	<0.01
Arsenic, As	<0.01	<0.01	0.68	0.08	<0.01
Copper, Cu	<0.01	<0.01	0.17	0.07	0.10
Zinc, Zn	0.08	0.18	0.29	0.13	0.25
Cadmium, Cd	<0.01	<0.01	<0.01	<0.01	<0.01
Sodium, Na	11	56	215	52	104
Calcium, Ca	29	120	<8.4	24	13
Magnesium, Mg	1.5	2.9	<0.2	4.6	<0.1
Potassium, K	3.5	11.5	88	4.9	17
Bicarbonates, HCO_3	44	88	878	102	249
Nitrate Nitrogen, N	0.23	0.20	0.09	0.67	0.12
Sulfate, SO_4	53	313	<25	58	<10
Chloride, Cl	6.0	33	90	42	50
Manganese, Mn	0.15	0.37	<2.5	0.35	<1.25
pH	6.1	6.4	8.3	6.8	8.2

TABLE II-1 (Continued)

Analysis Parameters	Sample W-1	Sample[a] W-2	Sample[a] W-3	Sample[b] W-4	Sample[a] W-5
Total Dissolved Solids @180°C	260	784	1,682	452	800
Total Organic Carbon	37	64	250	30	147

[a]Samples contained trace amounts of Alpha BHC.

[b]Sample contained trace amounts of other unidentified chlorinated compounds.

Identification

Samples identified as: Job #3818-068-09
(W-1) 8/5/81 11:15, (W-2) 8/5/81 1:15
(W-3) 8/6/81 1:00, (W-4) 8/5/81 5:15
(W-5) 8/6/81 10:50

Samples filtered through a .45u millipore filter before analysis.

TABLE II-1A

CHEMICAL ANLAYSIS OF GROUND WATER SAMPLES
COLLECTED May 1982
(Expressed in mg/liter unless otherwise designated)

Analysis Parameters	Sample[a] W-4	Sample[a] W-5	Sample[a] W-6	Sample[a] W-7	Sample[a] W-8
Arsenic, As*	0.6	<0.01	0.3	<0.01	0.9
DDT	<0.001	<0.001	<0.001	<0.001	<0.001
Chlordane	<0.001	<0.001	<0.001	<0.001	<0.001
Toxaphene	<0.001	<0.001	<0.001	<0.001	<0.001
Endrin	<0.001	<0.001	<0.001	<0.001	<0.001
Dieldrin	<0.001	<0.001	<0.001	<0.001	<0.001
Aldrin	<0.001	<0.001	<0.001	<0.001	<0.001
Heptachlor	<0.001	<0.001	<0.001	<0.001	<0.001
Lindane	<0.001	<0.001	<0.001	<0.001	<0.001
DDD-p	<0.001	<0.001	<0.001	<0.001	<0.001
DDD-o	<0.001	<0.001	<0.001	<0.001	<0.001
Captan	<0.001	<0.001	<0.001	<0.001	<0.001
Parathion	<0.001	<0.001	<0.001	<0.001	<0.001

[a]Samples contained some components of diesel fuel.

*Sample filtered through a .45μ millipore filter before analysis.

Identification

Samples identified as: Job #3818-068-09
W-4, W-5, W-6, W-7, W-8

TABLE II-2

CHEMICAL ANALYSIS OF SOIL SAMPLES
(Expressed as mg/l in extracted solution)

Results of Analysis	Sample[a] B-1-5	Sample[b] B-3-5	Sample[c] B-4-5
DDT	<0.001	<0.001	<0.001
Chlordane	0.001	<0.001	<0.001
Toxaphene	<0.001	<0.001	<0.001
Endrin	<0.001	<0.001	<0.001
Dieldrin	<0.001	<0.001	<0.001
Aldrin	<0.001	<0.001	<0.001
Heptachlor	<0.001	<0.001	<0.001
Lindane	<0.001	0.002	<0.001
DDD-o,p'	<0.001	<0.001	<0.001
DDD-p,p'	<0.001	<0.001	<0.001
Captan	<0.001	<0.001	<0.001
Parathion	<0.01	<0.01	<0.01
Arsenic, As	<0.01	<0.01	<0.01
Copper, Cu	<0.01	<0.01	<0.01
Zinc, Zn	0.70	0.76	0.60
Cadmium, Cd	<0.01	<0.01	<0.01
Sodium, Na	10	8.3	33
Calcium, Ca	16	24	21
Magnesium, Mg	7.8	1.0	1.9
Potassium, K	17	0.8	22
Bicarbonates, HCO3	<1.2	<1.2	<1.2
Nitrate Nitrogen, N	0.05	0.04	0.04
Sulfate, SO4	4.5	11	13
Chloride, Cl	<2	<2	<2
Manganese, Mn	<0.05	0.3	<0.05
pH	7.9	4.9	8.1
Alpha BHC	<0.001	0.007	<0.001

[a]From Boring B-1, depth 10.5 feet.

[b]From boring B-3, depth 10.5 feet.

[c]From Boring B-4, depth 10.5 feet.